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ABSTRACT

This document, described as both a "research report" and the seventh item in a series dealing periodically with various educational issues, contains six articles discussing diverse educational topics. Papers include: (1) "Problem Posing in Mathematics Education" (Andras Ambrus); (2) "Cooperating Teachers and Their Role in Students' Teaching Practice" (Friedrich Buchberger); (3) "Teacher's Purposes and Student's Intentions. Do They Ever Meet?" (Pertti Kansanen); (4) "On Some Psychological Contributions to Theory and Practice of Instructional Design" (Andrei Podolskij); (5) "Some Characteristics of Education in Finland and in the Czech Republic: A Comparative View" (Jan Prucha); and (6) "Den inlarningspsykologiska grunden for didaktik" (Claes-Goran Wenestam). (ASK)

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Research Report 175

DISCUSSIONS ON SOME EDUCATIONAL ISSUES VII

Edited by Pertti Kansanen

Department of Teacher Education
University of Helsinki

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Problem Posing in Mathematics Education

András Ambrus

Introduction

In 1996 the Hungarian nation commemorates the 1100th anniversary of a decisive event in its history, the Magyar Conquest. Our migrating ancestors took possession of the Carpathian Basin in the last decade of the 9th century. In 1996 we also commemorate the thousandth anniversary of the birth of Hungarian schools. The foundation of a monastery in 996 is considered as the symbolic starting point of the Hungarian education system. It is a great honour for me in this anniversary year to write about some ideas which play an important role in Hungarian mathematics education on the University of Helsinki, in the capital of our relative finnish nation. My topics is the problem solving and first of all the problem posing. Thank to George Polya, problem solving was always a central question in Hungarian mathematics teaching. In the last decades there is a growing interest internationally to investigate the problem posing behavior of the students. We try to classify the problem posing types on the basis of international mathematics didactics literature. We analyse some difficulties students may have with "What if not?" strategy and with representations. Analysing four relative problems taken from Hungarian resp. Czech problemcollections we try to answer the question: in which order should we pose relative problems for our students, give them more chance to be effective in their solution. Finally we formulate some instructional recommendations.

I. Theoretical backgrounds

In our opinion *problems* are, in which students *must do more than just apply a known procedure.*

According to the starting and goal situations of the problems we may speak about *closed problems,* when their starting and goal situation exactly explained; and about *open problems* if the starting situation and/or goal situation are not exactly explained.

1. Different interpretations of open problems in mathematics and didactics of mathematics

1. In the discipline of mathematics the term is used to a previously specified problem that has remainded *unsolved* for a long time.

2 A problem may be considered *open,* because it is susceptible to *different interpretations or to different acceptable answers.* Many application problems are of this type.

3. Problems are open in the sense that they *invite different methods of solution.*

4. Problems are open if they *naturally suggest other problems or generalizations.*

2. Problem posing is a creation of a new problem from a situation or experience. It can occur *prior to problem solving,* when problems are generated from a given situation; *after problem solving,* if problems are generated on the basis of the experience of solving praticular problem or set of problems. Some experienced problem solver think about the problem posing inside of the problemsolving process: at a concrete step they pose the question: does it function in other cases too?

Problem posing is identified as an important aspect of mathematical activity. Hadamard identified the ability to formulate research problems as an indicator of mathematical talent.

In Polya's Problem Solving Phases we can find direct references to problem posing aspects: *Think a related problem. Examine the solution to a given problem. Generate related problems that might be solved in similar ways.*

3. Connection between problem posing and open problems.

The process of problem posing can be considered as a problem solving process in which the solution is ill defined, since there are many problems that could be posed. In this sense *mathematical problem posing is a type of open problems.* A lot of open problems evoke and engage the process of problem posing.

Some didacticians state we should separate the problem solving resp. problem posing processes, because the problem solving happens on the object level, while the problem posing on the metalevel. In our opinion it is impossible this rigid separation, let us think for the use of heuristics strategies in problem solving processes (Use of analogy for example. Applying these strategies happens on the metalevel too. The meaning of analogous problems, questions, solutions are metalevel problems.) A lot of new problems may arising inside of the problem solving process. For this reason we will analyse the students' achievement in both domains together. But we accept the view that in mathematics teaching we shall give special attention, emphasis to problem posing, to discuss the problem posing types, their usage.

II.Open problems in mathematics teaching

"Students in grades 9-12 should also have some experience recognizing and formulating their own problems , an activity that is heart of doing mathematics." (Curriculum and Evaluation Standards for School Mathematics NCTM 1989, p. 138)

"Teaching mathematics from a problem-solving perspective entails more than solving nonroutine but often isolated problems or typical textbook types of problems. It involves the notion that the very essence of studying mathematics is itself an exercise in exploring, conjecturing, examining and testing - all aspects of problem solving.... Students should be given opportunities to formulate problems from given situation and create new problems by modifying the conditions of a given problems. (Professional Standards for Teaching Mathematics, NCTM 1991. p. 95)

In the new Hungarian National Mathematics Curriculum it is not mentioned directly the use of open problems. From some of its statements can we refer to open problems. *The aim of Mathematics Teaching is to develop a flexible, disciplined way of thinking, to discover things and to search for creative solutions. Heuristics, constructive thinking, and the use of analogies all have part in thinking processes. Interpreting mathematical problems, solving them, and examining simple, short mathematical texts all add to the development of independent learning. Practice in solving mathematical problems. The possibility of several solution. Developing discussion ability. Applying different ways of checking. Representing mathematical problems.*

Different types of problem posing used in mathematics teaching

Based on the international mathematics didactics literature we give a rough classification for problem posing in mathematics teaching. Another aspect we took into consideration: our teaching practice. For this reason we are the opinion that the solution of a problem in different manner and using different representation forms mean from the point of view of students new problems. In this sense we sort them to the problem posing too.

1. *"What if"*, *"What-if-not?"* instructional approach.

This method incorporates features of open problems and problem posing into the teaching of mathematics by emphasizing the generation of new problems from previously solved problems by *varying the conditions or goals of the* *original problem*. Applying this approach to a theorem we pose the question: *What if it were a false statement?*

2. *Generation of multiple solutions to a given problem* may be associated with openness.
3. *Use of analogy*. First of all we think for plane vs. solid geometry problems.
4. *Generalization*. Here we must notice that how to generalize from one or more inctances, remains virtually unexplored in either research studies or practical experience.
5. *Using different representations to the solution of a problem* may yield additional processes for generating problems. How a problem-situation is represented will determine what problems can be derived from the situation as well as how they are solved.

III. Experiences

Kilpatrick (1987) reviewed research on topic of problem formulation and problem posing, he found there had been little or no systematic research on mathematical problem posing. Silver (1993) identified much more research but reached a similar conclusion that research on mathematical problem posing was unsystematic and did not yet provide an adequate scientific research base on which to build instruction or assessment. Most research on problem solving considered only the solution of "closed" problems.

"Generally lacking are detailed descriptions of students' processes used in solving open problems or of instructional experiments involving the use of open problems accompanied by careful analyses of student outcomes. For example, almost no research has been conducted on the efficacy of the "What if not" approach to teaching mathematics." (SILVER, 1985)

In a quite new article Silver confirm the opinion above: *"...there is clearly a need for much more systematic research in this area, in order to build coherent understanding of the nature of solution processes associated with open problems and of the impact that experience with open problems can have on student learning of important mathematical ideas." (SILVER, 1995)*

We will discuss shortly two questions. The first one concern the "What if not" strategy based on our investigations and observations. We investigated not the whole phenomenon, but only the use of indirect argumentation, *"What it it were a false statement?"* In the second question we present the difficulties students may have at the use of different representation forms, analyzing some international findings.

1. The use of "What if not?" strategy.

The use of this strategy for proving theorems based upon the understanding of implication and its negation, and upon the right use of them. In a student-test from 227 secondary school students only 1 student has formulated the negation of implication in a right manner. (AMBRUS, 1992) For most of the questioned students were the statement and its converse resp. its negation equivalent. We need to remark that the secondary school from the students were chosen is an elite school in Budapest.

In an inteview there were 9 secondary school students (6 from Grade 8 and 3 from Grade 12) asked. From our point of view interesting are the next problems posed for the questioned students.

1. *To prove: If* n *is a natural number and* n^2 *is even, than* n *is an even number too.*

2. *To prove: For all triangles : If* $\beta > \alpha$ *than* $b > a$, *where* a *is the opposite side to angle* α *and* b *is the opposite side to the angle* β

Student-responses

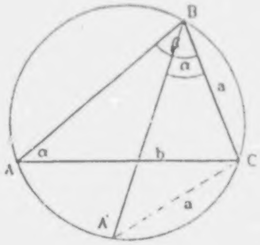
1. Example

Nobody started with posing the question *What is if n not an even number?* The best student from Grade 12 proved the statement directly following way: *If* n^2 *is even we may express it in form* $4k^2$ *because* n^2 *is a square number divisable by 2 and in a square number the primfactors have an even exponent.* $n^2 = 2^2 \cdot \ldots\ldots = 4k^2$ *The square root of it is 2k, that is even.*

Remark: With the use of contraposition we can prove the statement very shortly: "*If n is an odd number, then its square odd too" statement is equivalent with our original statement.*

2. Example

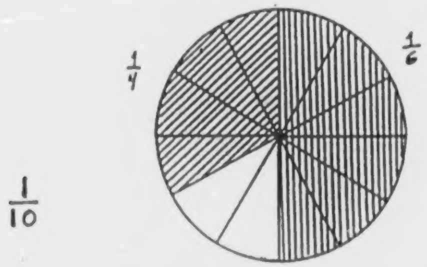
From our point of view only interesting is that nobody used the strategy *"What if not?"*. The only one correct solution given by the same student as above was a direct proof newly. *Let us assume that* $\beta > \alpha$ *Let us consider the circumscribed circle to triangle ABC. We measure the angle* α *in the angle* β *as seen in the figure. The length of the chord AC must be greater than the chord A'C . It is possible to show with help of corresponding angles and trigonometry this relation.* We do not want to detail the solution. To other students gave the interviewer as help the advice: *It is known for you the statement : For all triangle: If* $b > a$ *than* $\beta > \alpha$, *you may use it.* Nobody could use this help.



Similar event was observable in a mathematical class: The theorem *If* $b > a$ *than* $\beta > \alpha$ could the students to prove without difficulties. They gave clever proofs, their teacher was proud for her pupils. She gave as homework to prove the converse of this theorem. She was convinced that her students will bring nice ideas and can solve the problem without difficulties. Surprisingly for the teacher nobody could prove the theorem rightly. Everybody tried to prove it directly with help of ideas they used by the proof of the original theorem. But those ideas did not work. *Summary: without careful introduction made by the teacher, the students do not use the strategy "What if it were a false statement?". It seems that the students are strongly fixed to conditions given in the tasks. Other basic condition of the use of this strategy is the clear understanding of the logical connections between a statement and its negation.*

2.Representations

Pupils may have difficulties at the use of different representation forms. In an interview Hasemann asked the pupils to solve the next tasks (HASEMANN, 1987). 1.Compute $\frac{1}{4}+\frac{1}{6}$. 2. Shade first $\frac{1}{4}$ of the circle and then $\frac{1}{6}$ of the circle as well. What fraction of the circle have you now shaded altogether? Ann (aged 13) solved the problem like this: she spontaneously shaded 4 twelfths (for $\frac{1}{4}$), then 6 twelfths (for $\frac{1}{6}$) and her answer was $\frac{1}{10}$. She did the calculation right without any problem. When the interviewer asked her, which answer is the correct one, she answered: *"Both are correct."* Interviewer: Why? *"Yes, first* $\frac{1}{10}$*, I counted this; and* $\frac{5}{12}$*, I calculated."*



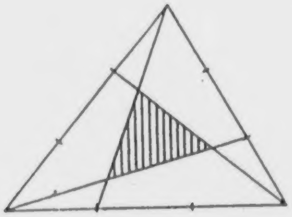
In the higher grades are problems with representations also.. In Grade 9 of a secondary school observed the visitor the next event. (JANVIER, 1987) The problem was to solve the $\sqrt{x}=-x+6$ equation. The students solved it algebraically and have got two solutions, 4 and 9. They stated that the equation two solutions has. The visitor asked the class to draw the graphs of the functions $y=\sqrt{x}$ and $y=-x+6$ in a common coordinate system, that means to solve the equation graphically. In this case the students have got only one solution, namely 4. The visitor asked them, how many solution has our equation. The students stated newly two, 4 and 9. Their mathematics teacher remained his students for the last point of the procedure they fixed for the solution of square-root equations. *"Check your solution by substituting the results into the original equation."* Checking the results this manner accepted the students, there is only one solution.

Both examples show that the two representation forms (visual and symbolic) exist quite separate from each other in the students' mind, there is no connection between them.

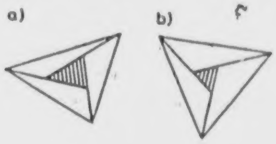
3. A Middle-European example

We present some relative problems taken from Hungarian resp. Czech problem-collections to illustrate the typical situation in these countries. In a Hungarian problem-collection are the following two problems posed in the same order as we present them. (1. and 2. problem) After them we present futher relative problems from other sources. (3. and 4. problem)

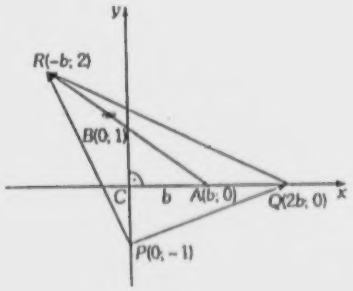
1. What is the ratio between the areas of the shaded part of the triangle and of the whole triangle? The sides of the triangle are divided into three equal parts and some divisor points on each side are connected with the opposite vertexes as seen in the figure.



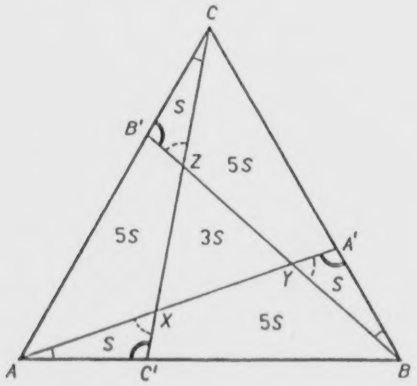
2. We lenghten the sides of a triangle with the length (with double of the length) of the sides following one round-direction. What is the ratio between the areas of the original and the new bigger triangle? (ROKA, 1992)



3. We lengthen the sides of the right triangle ABC: the side AC from the point A with AQ=CA, the side AB from the point B with BR=AB, and the side BC from the point C with CP=BC segments. What is the condition that the triangles PQR and ABC are similar to each other. (A Matematika Tanitasa, 1996)



4. In a regular triangle ABC with length of sides 9 cm we take down the points A', B', C' so that yields: AC', BA' and CB' are 3 cm long. We construct the triangle XYZ as shown in the figure. What is the ratio between the areas of triangles XYZ and ABC? (KURINA, 1996)



Some comments and questions:
These problems and the placement of them mirror our situation. Most of the problems are posed isolated. There are raising some questions: *Which one of the problems presented above shell we handle first in our mathematics class? In which order should we pose the other problems?*

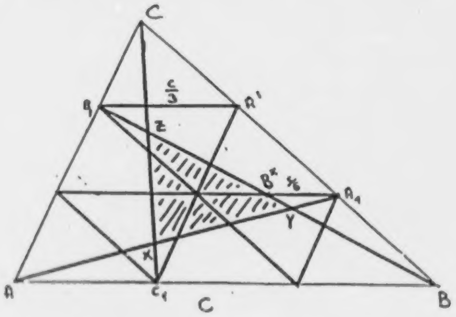
There is an opinion we shall start with the most special problem, also with the fourth one, with the regular triangle. But the solution of this problem quite difficult for the average students. (Noticing the similarity of triangles, use of cosin theorem.) Other possibility to start with the second problem, here considering first the regular case and then the general one. (In their solutions there is no difference!) This order seems to be more natural from the point of view of students, because there is a direct comparison possibility between the sides and the altitudes of the corresponding triangles. Next step could be to lengthen the sides with an arbitrary factor. *What if we lengthen the sides with 2, 3, ...n times of their length?* The same comparison method works in each cases. If we lengthen the sides with n-times of the length of the sides, the ratio of the areas will be $3n^2 + 3n + 1$ (The side of a "completing" triangle will be n times as long as the side of the original triangle, and to it belonging altitude will be $(n+1)$-times as long as the altitude of the original triangle. We have 3 completing triangle)

The problem 1. may occur as an extension of these problems. *What if we lengthen the sides of the original triangle on the other direction too?. These lines intersect the sides of the big triangle. What is the ratio of the so obtained segments in one side? What if we start from these divisor points and we construct the "inside triangle" as in the 1. task? What is the ratio of the areas in this case?* We may discover the connection between the first and the second problem. If we lengthen the sides of a triangle for example with the length of sides, the continuation of the sides intersect the sides of the big triangle in the points which are one of the points dividing the sides into 3 equal parts. That means there exist to each triangle an "inside triangle" with the property: starting from inside triangle with lengthening the sides with its length we get the original triangle. In essence we solved the first problem. The ratio of areas is *1:7.* In the case of n-times lengthening the sides of the original triangle, the continuations of the sides on other direction intersect the sides of the big triangle in points which divide the sides of the big triangle in a ratio $n:(n+1)$. With help of this knowledge we can solve problems like 1.typ. For example if we connect the divisor points of a triangle which divide the sides in a ratio 5:7 with the opposite vertexes, we can determine n. $5:7 = n:(n+1)$ Solving this equation we get $n = 2.5$. Therefore in case 2.5 times lengthen of the sides will we get a big triangle with characteristic given in our problem. The areas have the ratio *27.25:1 resp. 109:1.*

The 4th problem a special case of the first problem. At the solution of third problem we can use some ideas taken from the solutions of first resp. second problems, of course the similarity condition needs special considerations.

At the higher level we can use the vector resp. analytic geometry methods. Determining the coordinates of one of the vertexes of "inside triangle" XYZ we can express the altitude resp. the area of the "completing" triangles.

We give a "visual" solution for the first problem. The main idea of this solution is the use of triangle grid for our situation, that means the sides of the basic triangle of the grid are third part of the sides our triangle. (See the figure!)



From the construction follows: ABY triangle similar to A_1B^*Y triangle because the corresponding angles are equal. From the triangle grid follows

$$A'B_1 = \frac{1}{3}AB, \qquad B^*A_1 = \frac{1}{2}\cdot\frac{1}{3}AB = \frac{1}{6}AB$$

$$AY : YA_1 = 6:1 \quad \Rightarrow \quad AY : AA_1 = 6:7$$

The altitude of the triangle ABY belonging to the side AB is 6/7th part of the altitude of the triangle belonging to the side AB in the triangle ABA_1. That means the area of the triangle ABY is 6/7th part of the area of the triangle ABA_1. We know that this area is one third part of the area of triangle ABC. It follows that the area of the triangle ABY is 6/21th part of the area of the triangle ABC. The sum of the area of the three "completing" triangles is 18/21th part of the area of the whole triangle. The area of the "inside triangle" XYZ is 3/21th part of the area of original triangle, also the ratio of their areas is 1:7.

The power of this solution is that it is applicable for arbitrary divisor points. The triangle grid (triangle-net) we may adopt to the given divisor points.

IV: Instructional recommendations

1. *Students learn extensively from and by examples* and the teacher is the students' primary example of a mathematics problem solver, it could be productive for teachers to model explicitly problem solving processes and problem posing, problem formulating activities in the classroom. *Explicit knowledge representation process, such as creating symbolic, pictorial, diagrammatic, or graphical models of a problem situation, need to be exemplified and discussed by mathematics teachers also. Students need to see that there is often more than one way to represent the information in a problem and that correspondences can be made between and among the various representations.* We would like to refer to G. Polya who emphasized that the most talented pupils need models first too, later on they can use them creatively.

2. Metalevel processes, such as *planning, monitoring and evaluation* are important components of mathematical problem solving behavior. Unfortunately these processes are seldom made the explicit focus of instruction. Students may need explicit instruction in monitoring and evaluating their problem solving behavior. One successful technique is having students solve problems in pairs, in which one student acts as the "solver" and the other acts as the "monitor". The role of monitor is to ask questions that clarify the nature of the problem-solving activity of the solver. After solving some problems this way, the students can exchange roles. To emphasize the role of *planning,* students might be asked to design an explicit plan for the solution of the problem before beginning any calculations.

3. Textbooks provide a lot of examples from which a learner can generate an understanding of the conceptual or procedural knowledge being studied, they often provide examples that have been worked out specifically to demonstrate application of the procedural and conceptual knowledge. However textbook almost never provide examples of *knowledge representation, or heuristic or meta-level problem solving processes. They should contain examples to present these processes. It follows from our analysis above, we shall pay more attention to the order of posed problems in the textbooks.*

4. *Metalevel processes need to become an important curricular focus. Until these processes receive explicit attention in the curriculum, and until the exams do not require real problemsolving, the teachers will continue the mechanistic teaching, which produce mathematics students who know fairly well what to do in routine and simple problem situations, but have little competence in handling unfamiliar or complex problems.*

5. Sweller's studies (OWEN, SWELLER 1985) indicated that students are able to learn usable knowledge and skills more effectively through experience with non-goal-specific problems than with traditional goal-specific versions.

According to Sweller (1983) when students solve goal-specific problems, they use general strategies which are effective for solving specific problems but which are less effective for making connections among concepts and procedures or for organising knowledge.

The non-goal-specific problems offer opportunities for students to use strategies which make important relationships more salient, thereby helping students to develop better organised knowledge and more usable skills. Works on ill-structured problems has shown that their solution involves the integràtion of a broad range of ideas about the task domain and the coordination of this knowledge with complex reasoning and argument patterns.

6. Our discussion about the four problems above confirm the importance of the selection and of the order of the posing the problems. Because of limited time in the teaching the teachers need to choose the problems very conscious. From a problem-field they need to choose that problem as the starting one which is most suitable for the posing other problems and its solution not unattainable for the most of students.

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Cooperating Teachers and their Role in Students' Teaching Practice[1]

Friedrich Buchberger

"School - based teacher education/training" or "partnership of institutions of initial teacher education (ITE) and schools" are new buzz words frequently used in recent reports of OECD - the Organization for Economic Cooperation and Development which about some think that it might be the critical international conscience of national education policies. These buzz words which may inter alia be found in the OECD reports "The Teacher Today" (1991) or "Quality in Teaching" (1994) reflect both

(a) the high importance the teaching practice component of programmes of teacher education (TE) ought to occupy and

(b) problems within this component in ITE and its relationships to schools (cf. MORINE-DERSHIMER/LEIGHFIELD 1995).

Measures taken to reduce perceived problems and to improve the quality of the teaching practice component in programmes of ITE in the member states of OECD differ widely. England and Wales have introduced a model of "school - based teacher training" in which

(a) schools themselves have major responsibility for the training of prospective teachers and

(b) prospctive teachers have to spend (sometimes more than) two thirds of the entire time devoted to teacher training (cf. ADAMS/TULASIEWIECZ 1995, HALSTEAD 1994).

This highly debatable English solution - or better non-solution - may be seen as a renaissance of an outdated apprenticeship model of teacher training. Other countries like France (cf. BLONDEL 1991) or Austria (cf. BUCHBERGER/GRUBER 1995) orient themselves on the concept of an "open professionalism" (cf. P.LADERRIERE 1991) and think that it is necessary to redefine the curricula of ITE in general and to develop curricula for the teaching practice component in particular. However, the role and the tasks of cooperating teachers - i.e. teachers working in schools and sharing responsibility for the teaching practice component in ITE - are becoming increasingly important. Teachers at training and/or model schools and cooperating teachers at regular schools as well as university supervisors are confronted with higher expectations and more demanding tasks.

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[1] This article is a modified version of a lecture given at the Department of Teacher Education of the University of Helsinki.

What might be the role of these cooperating teachers in programmes of ITE? Which tasks are they expected to fulfil in the teaching practice component? How might they contribute to the improvement of ITE in general and teaching practice in particular? In dealing with these questions I will mainly describe and analyse developments at my own institution (Paedagogische Akademie des Bundes in Oberoesterreich/Austria) where we have paid particular attention both

(a) to the development of coherent curricula for teaching practice and
(b) to cooperating teachers, their role and professional development.

In a first paragraph I will outline some results of research on teaching practice and its supervision. Secondly, I will briefly describe the context in which teaching practice takes place at my institution. A third paragraph will deal with a model for teaching practice and its supervision developed by myself and eight Austrian colleagues (cf. BRENN/BUCHBERGER et al. 1991). In a fourth paragraph I will outline two major elements of this model namely the professional portfolio of student teachers ("Praxisdokumenation") and work on priority areas ("Schwerpunktarbeit"). A final paragraph will deal with some experiences with this model for the supervision of teaching practice and discuss some main findings. I do hope that I will be able to provide some stimulating and challenging input to discussions and activities here in Helsinki, although I am very well aware that this will not be an easy task as compared to most other member states of OECD TE in Finland is known for its high quality (cf. HANSEN 1995, KOHONEN/NIEMI 1995, TELLA 1996).

1. Teacher education: goals and realities

There is widespread agreement that teacher education (TE) has to be conceived as an open and dynamic system. Its major goal consists in the support of the development of abilities and attitudes for professional acting in all domains of the teaching profession (teaching, education, counselling, evaluation, administration, innovation). Following the concept of an "open professionalism" (P.LADERRIERE 1991) professional acting may be described as reflective, theory-oriented, competent, collaborative and responsible.

Despite the fact that this concept of TE is widely accepted in principle, realities of TE have to be characterized by different and discrepant patterns in most member states of OECD. Most models of TE may be seen as loosely coupled conglomerats following more outdated traditions than rational or research-based argument. Implicit assumptions guide the programmes and their goals are often vague, unclear and inconsistent. Curricula are frequently fragmented and uncoordinated. Many programmes have only limited orientation on professional tasks of teachers and may not meet the demands of schools. Add to this that methodologies adopted by teacher educators frequently contradict to goals formulated ("preaching water and drinking wine"). Thus, it may not surprise that TE may be called a low impact enterprise in many member states of OECD (cf. BUCHBERGER 1996, BUCHBERGER/ BEERNAERT 1995, LANIER/LITTLE 1986).

Taking the practical component of ITE the following five goals are frequently stressed as important:

(a) Prospective teachers should acquire a broad repertoire of professional actions which may be seen as a necessary condition for flexibility in teaching ("adaptiver Unterricht", cf. BUCHBERGER/SATZKE 1980; JOYCE et al. 1981).

(b) In selecting actions appropriate to particular situations and problems (prospective) teachers should be able and willing to use criteria justifyable in educational and/or didactical theories.

(c) Student teachers should develop reflective and inquiry-oriented attitudes.

(d) The development of problem solving capacity may be seen as another important goal (cf. SCHÖEN 1983).

(e) Prospective teachers should become autonomous and responsible professionals able and willing for cooperation in teams at schools.

To achieve these goals an integration of theoretical and practical components of programmes of ITE seems to be indispensable. But, although the teaching practice component is highly valued by student teachers and demanding goals are formulated in reality it is often an appendix of ITE neither carefully planned nor integrated.

Research on the practical component of TE in English speaking countries indicates many deficits both within it and in relation to theoretical components. To quote HOY/WOOLFOLK (1989, p.113):

"The picture that emerges from research on student teaching is disastrous. Although student teaching is seen as a critical aspect of TE, its influence on the novice teacher ranges from limited to negative."

STONES (1987) summarizes six major points of criticism:

(a) Teaching practice is not oriented on theoretical principles but pragmatic and oriented on fuzzy "experience".
(b) Theoretical courses and teaching practice are often unrelated.
(c) Lack of coordination and cooperation between universities and schools.
(d) Orientation on an apprenticeship model ("model the master", "sitting next to Nelly"). STONES views this orientation as
"the most formidable and intractable obstacle to progress in TE".
(e) Casuality.
(f) Deficits in the supervision of teaching practice both by university supervisors and cooperating teachers (cf. COOPER1995, JOYCE 1988).

In summarizing research on the supervision of student teaching in German and English speaking countries BUCHBERGER/BRENN (1989) mention six main issues:

(a) Supervision of student teaching is often viewed as an appendix of ITE. It is seldom carefully planned. There is a lack of clear descriptions of tasks and competencies of supervisors and cooperating teachers. Education and training for both supervisors and cooperating teachers to fulfil these important roles is still pending (cf. WILSON 1994). To quote KLATTENHOFF (1995):
"Die Lehrerbildungsbildung ist um zweihundert Jahre hinter der Zeit zurückgeblieben."
(b) Supervision is frequently done on a pragmatic level and not theoretically based. Supervisors focus on topical events and their feedback is casual. Coordinated and continuous support for developing professional action structures is given only to a limited amount. This may be seen as a (reckless) neglect of basic principles of teaching and learning (and one of the many big contradictions of ITE).
(c) Supervisors and cooperating teachers focus on phenomena on the surface and do not take into account conditions of the context of student teaching and learning. This focus correlates with a low rate of acceptance of feedback given by university supervisors as well as cooperating teachers.
(d) A clear relationship between actions of supervisors, learning opportunities at university courses and actions of student teachers in teaching practice does not always exist.
(e) Supervisors are sometimes perceived as "disturbing school visitors" by cooperating teachers as well as student teachers instead of an integrated resource.

(f) Student teachers find themselves often in conflict between beliefs and attitiudes of university supervisors and cooperating teachers - and their personal beliefs ("chameleon-effect"). There is the impression that ITE is comprised of three unrelated "worlds":

- a "world of theory" represented by university supervisors,
- a "world of practice" represented by cooperating teachers, and
- an "inner world" of student teachers.

Maybe that these issues outlined sound a little bit (too) negative, but on another side they may be seen as a mirror to evaluate programmes of teaching practice and the supervision given there. Additionally, it should not be neglected that a host of (development) projects has brought about many valuable insights to improve the supervision of teaching practice (cf. C.TURNEY et al. 1985).

2. The context of teaching practice at Pädagogische Akademie des Bundes in Oberösterreich

Some information on the programme of ITE and its teaching practice component at my own institution necessary for a fuller understanding of the following will now be outlined. The programme follows a concurrent model which means that

(a) theoretical studies in educational sciences (Humanwissenschaften),
(b) subject didactics (Fachdidaktiken),
(c) academic disciplines (Fachwissenschaften) and
(d) teaching practice (Schulpraktische Ausbildung)

have to be studied in parallel aiming at their integration (cf. BUCHBERGER 1995). Around 20% of the programme are devoted to teaching practice. From the second semester on students spend sixty hours per semester in the training and model school (Übungsschule) or other schools (Ausbildungsschulen) at which teaching practice takes place. In addition to regular teaching practice outlined the programme for teaching practice contains the following other components:

(a) Observation and analysis of teaching (Unterrichtsanalyse) in the first and fourth semester.
(b) Microteaching of a duration of thirty hours in semester two and three.
(c) In the fifth semester a practicum of a duration of three weeks takes place at schools all over the country.

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(d) An education practicum with children outside school (Ausserschulisches Erziehungspraktikum) of a duration of sixty hours which has to be organized by the student teachers themselves.

Paedagogische Akademie has a training and model school of its own and a network of schools at which both especially selected as well as trained cooperating teachers work for ITE. Even the cooperating teachers for the three weeks practice period receive special training. Cooperating teachers are called "AusbildungslehrerInnen" underlining their role as responsible persons for teaching practice and as teacher educators.

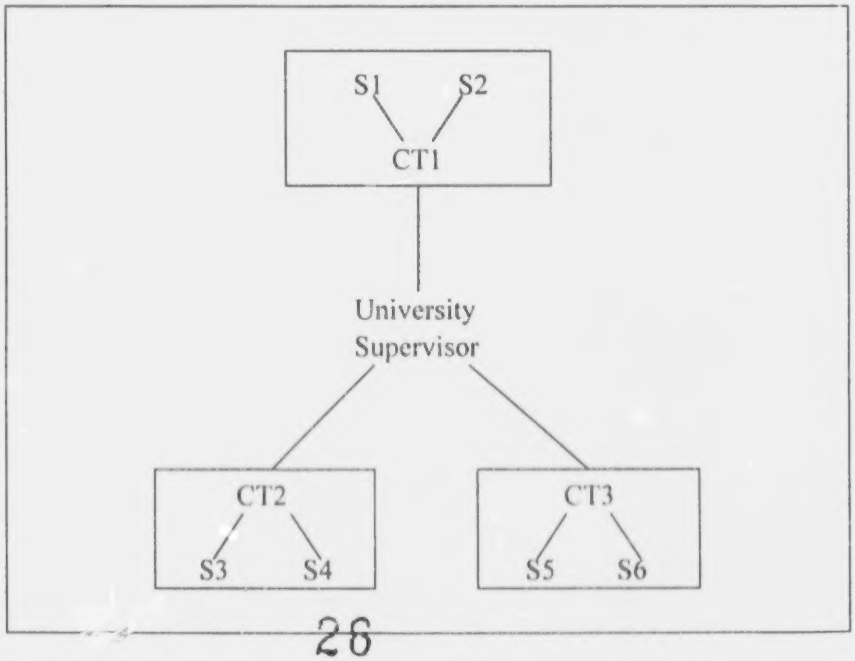
Teaching practice is organized in small teams - one might even say quality circles or collaborative problem-solving groups (cf. F.BUCHBERGER 1995) - which cooperate for one semester. These teams or quality circles consist of

(a) one university supervisor (mainly lecturers of subject didactics and in addition professors as well as lecturers of educational sciences and some teachers of the training school). University supervisors are called "PraxisberaterInnen" to underline their role as counsellors and facilitators of student learning;

(b) three cooperating teachers and

(c) six students.

Diagramme 1: Collaborative problem-solving groups/quality circles



Supervisors may use four weekly hours of their working load for supervision which equals sixty hours per semester. Students teach fifteen lessons per semester, observe teaching of another student for another fifteen hours per semester and plan, analyse and reflect together with their cooperating teacher for another thirty hours per semester. The quality circles themselves take decisions on how to proceed within this framework. Cooperating are very well paid for their work in ITE (some 15 % increase in salary).

Teaching practice is coordinated by a head of department for teaching practice. Supervisors are obliged to meet regularly. Prospective cooperating teachers need special training courses to be accepted by the institution. They then are obliged to permanent inservice education and to participation in development projects. A very positive culture has been developed and teaching practice is subject to permanent improvements in which all groups of persons mentioned above are actively involved. One intermediate result may be seen in a coherent semi-structured curriculum for teaching practice, another in the 4 K - model of supervision of teaching practice.

3. 4 K - model of supervision of teaching practice

Supervision of teaching practice is conceptualized as continuous and coordinated support of student teachers by university supervisors and cooperating teachers in developing professional action structures in all domains of the teaching profession (e.g. education, teaching, counselling, evaluation, administration, improvement and innovation). It is not restricted to the development of competences and skills, but incorporates integratively the development of attititudes for reflective, autonomous, responsible and collaborative action. The focus is on
(a) active learning,
(b) development processes of student teachers and
(c) cooperative problem-solving.

This implies that
(a) neither a mere application of principles of educational or didactical theories
(b) nor casualities of practice form the focus of interest.
Instead, learning situations have to be created in which students teachers have ample opportunity to define problem-spaces and to experiment on problem-solutions taking into account principles of (educational and didactical) theory.

Thus, supervision might become an effective support in developing integrated professional action structures. In this respect it may be seen in close relation with the concept of "powerful learning environments" (cf. F.BUCHBERGER et al. 1994).

Because of its main elements the model is called 4 K - model (Kooperation/cooperation, Kontinuität/continuity, Kriterienbezug/criterion-reference and Kontext/context).

(1) ***Cooperation.*** Cooperation means that supervision is conceived as a collaborative problem-solving process of supervisors, cooperating teachers and student teachers in small teams. Within a semi-structured curriculum they cooperate on themes relevant to them, which means inter alia a collaborative definition of themes or priority areas on which to work on.

(2) ***Continuity.*** Continuity forms the second element of this model of supervision of teaching practice. Collaboratively defined goals and contents form the substance of the cooperative work over a longer period of time. Although it may sound trivial that the development of new concepts or skills needs time, this fact is neglected in many (other) models of teaching practice in which student teachers seldom find opportunity to work continuously on relevant themes. Priority is often given to demands of particular classrooms where student teaching takes place and student teachers cannot find opportunity for the development of professional competence and expertise. If someone would define casual as polarity to continuous I think that only very few teacher educators would explicitely orient teaching practice on a "principle of casuality".

(3) ***Criterion-reference.*** Criterion-reference means that within a semi-structured curriculum for teaching practice priorities/priority areas have to be defined for student teaching and that related to selected priorities criteria have to be developed. These element consists of two related levels:

(a) Firstly, supervisors, cooperating teachers and students have to agree upon (one) priority area (-s) which then guide (-s) the work in teaching practice over a period of one semester.

(b) Secondly, within a priority area selected the team has to define criteria by taking into account
  * educational and didactical theories,
  * practical knowledge of cooperating teachers, and

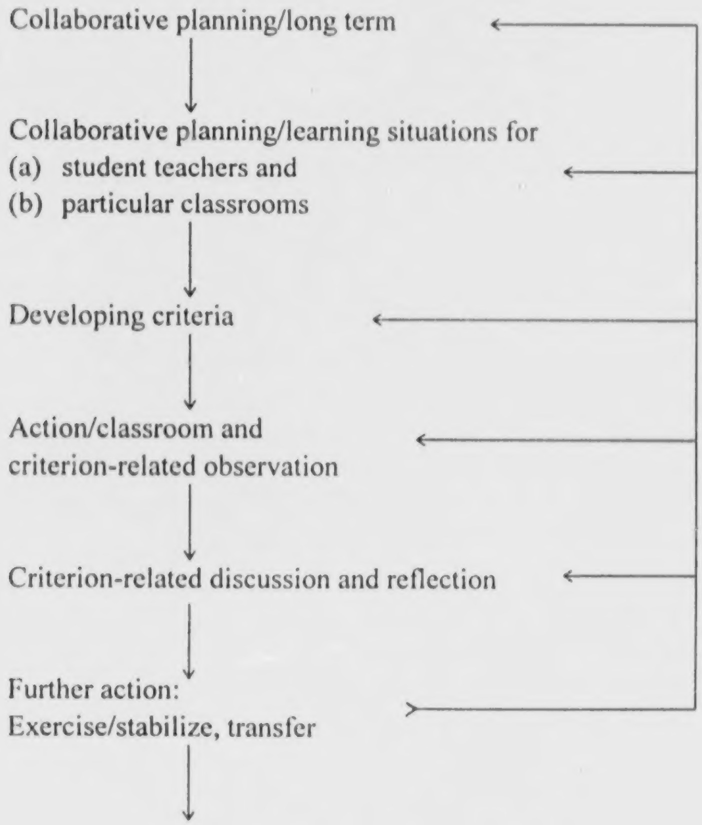
- experiences of student teachers.

These criteria form the basis for planning processes, observations, analyses and reflections as well as evaluations.

(4) ***Context.*** Learning opportunities for student teachers can only be created in specific contexts, which are made of many interrelated elements that have to be taken into account:

(a) Demands of particular classrooms as regards for example their curricula or needs of students.
(b) Curricula of ITE.
(c) Expectations and beliefs of supervisors and cooperating teachers
(d) Expectations and learning requirements of student teachers.

Diagramme 2: Supervision as a cyclical process


Collaborative planning/long term
Collaborative planning/learning situations for
(a) student teachers and
(b) particular classrooms
Developing criteria
Action/classroom and
criterion-related observation
Criterion-related discussion and reflection
Further action:
Exercise/stabilize, transfer

Six main aspects of this model may be summarized:

(a) Supervision as a cyclical process of
   - (long term/mid term/ short term) planning,
   - action in classrooms/observation,
   - analysis and reflection.

   In this respect the model has much in common with so-called action research or teacher research (cf. ALTRICHTER/POSCH 1990).

(b) Supervision as a continuous and collaborative problem-solving process.

(c) Supervision as pro-active planning of learning situations and establishing of powerful learning environments.

(d) Supervision as continuous work on themes and priorities over a longer period of time.

(e) Supervision as support in developing integrated action structures.

(f) Supervision as measure to integrate theoretical and practical components of ITE.

4. Professional portfolios of teaching practice and work on priorities („Praxisdokumentation" und „Schwerpunktarbeit")

Work done in teaching practice has to be documented by student teachers and they are obliged to prepare portfolios of teaching practice („Praxisdokumentation") from the first semester on for each semester. The portfolios form a central element for assessments of teaching practice. While in the first three semesters the portfolios may be primarily seen as a joint product of student teachers and cooperating teachers as well as supervisors, the portfolios of semester four to six represent independent work of students. A portfolio consists of the following parts:

(a) Syllabus of TE (Lehrplan der Paedagogischen Akademie) and relevant parts of the syllabus of schools (Lehrplan der Volks-/Hauptschule) as well as its interpretation (Lehrplanservice).

(b) Mid-term planning for a period of around six weeks (curriculum of particular school classes) which has to be submitted by the cooperating teachers in the second and third semester and may be seen as a joint product of student teachers and cooperating teachers in the fourth and fifth semester.

(c) Description of school classes (e.g. social context, motivation and learning prerequisites of students).

(d) (Pre-) Considerations on short-term planning and the planning of particular lessons (e.g. aims, objectives, content, methodologies). This part is mainly oriented on insights of a "kritisch-konstruktive Didaktik" (cf. KLAFKI 1992). Student teachers (as well as cooperating teachers) should learn to think in alternatives which may be seen as a challenge against a thinking in "single best methods" or dogmatism and rigidity.
(e) (Concrete) Lesson plans including alternatives.
(f) Teaching material used.
(g) Documentation of the work done on priority areas (see below).
(h) Documentation of additional tasks.

Within the portfolios particular attention has to be given to the documentation of the work on priority areas. Work on priorities may be described as follows:

(a) The semi-structured curriculum for teaching practice defines one compulsory priority area for each semester (e.g. for the second semester: structuring particular lessons in accordance with at least two theoretical models; for the fourth semester: mid-term planning). Students themselves have to select a second priority area reflecting their personal interests. Thus, work on priority areas reflects both compulsory elements to guarantee the development of competences necessary to fulfil the tasks of the teaching profession and personal elements to provide opportunities for the development of professional individuality.
(b) Student teachers experiment on one priority area a minimum of six lessons.

Documentations on priority areas („Praxisdokumentation“) consist of the following elements:

(a) As regards priority areas selected by the student teachers themselves they have to describe the reasons for this selection.
(b) Description of a "pool of measures" which may be taken to achieve the goals of a particular priority. This pool consists of (possible) measures, expected effects and theoretical considerations.
(c) Desciption of an action plan. This description contains a specific plan which measures might be taken in relation to a particular class and curriculum.
(d) Concrete plans for particular lessons in accordance with the action plan. These plans contain
    * concrete measures,
    * criteria for planning and observation,
    * results produced,

- feedback by student teachers, cooperating teachers and supervisors, and
- consequences to be made.

(e) (Self-) Evaluation on the work done within a priority area.

5. Some experiences and major findings

The programme of teaching practice finds itself in a permanent process of improvement directed by active participation and commitment of most participants. In relation to the first three K's (cooperation, continuity and criterion-reference) experiences and major findings as regards the role of cooperating teachers may be described as follows:

(1) At the beginning of the development process cooperating teachers were faced with severe problems of cooperation both with university supervisors and student teachers. Many measures have been taken to establish a basis for symetric cooperation among the university supervisors and the cooperating teachers, e.g.

(a) the supervisors provided all their curricular material of the theoretical courses to the cooperating teachers in order to develop a "common language";

(b) workshops on communication and cooperation were organized.

Although these measures have not been unsuccessful, expected improvements did not happen. A changed pattern of the organization of teaching practice, consisting in the establishment of small teams or quality circles brought about substantial progress. Many reasons may be taken to explain this, but I think these are very well known out of the literature on organizational psychology.

By orienting cooperation among student teachers and cooperating teachers on common curricular themes and priorities substantial improvements could be made. While this applies very well to aspects of the planning and reflection of teaching, problems seem to persist as regards cooperation in the form of team-teaching. Recent improvement activities focus on this aspect.

(2) In realizing continuity cooperating teachers had severe problems at the beginning. A rather debatable conception of learning to teach by experience and a focus on the curriculum of their classes have been main obstacles in creating

adequate and supportive learning situations for and with student teachers. Cooperating teachers have always provided recipes of reasonable quality and given casual feedback with many worthwhile suggestions. But, they did not perceive the differences of

(a) being a teacher of pupils and

(b) being a teacher educator with responsibility for the professional development of student teachers.

Again, the introduction of small teams and quality circles may be seen in close relation to improvements achieved.

(3) At the beginning of the development process cooperating teachers had no clear vision of their role as facilitators of the learning process and development of students. Undifferentiated and vague conceptions seemed to dominate. Neither wholistic nor very specific conceptions with there orientation on rather narrowly conceived competencies were perceived as satisfactory. In addition, cooperating teachers were confronted with the problem of an underdeveloped language. Measures have been taken to introduce a common language and this may be seen as one necessary condition for improvements. In a collaborative culture teachers′ practical knowledge and its language have received more attention and appreciation. The institution has invited then cooperating teachers to participate in the restructuring of the curriculum of teaching practice which has brought about a semi-structured curriculum shared by most cooperating teachers. Problem-centered and continuous work on priorities may now be seen as driving force for all participants to improve their competence as well as their scientific/theoretical base.

(4) Student teachers and cooperating teachers view the portfolios of teaching practice as an essential element. Portfolios are seen as an expression of work done and goals reached. They may be seen as source for permanent (self-) evaluation of the work of both student teachers and cooperating teachers. Many student teachers, cooperating teachers and supervisors think that the nonexistence of portfolios in former models of teaching practice has been something like a "missing link". Supporting students in work necessary to produce portfolios calls for high competence of cooperating teachers and it should not be disguised that some cooperating teachers not being able to fulfil expectations of student teachers as well as university supervisors had to leave the teaching practice component of ITE. It is only to add here, that university supervisors actievely involved in the development process have learned there

lessons too and view these as important in their professional development as teacher educators.

Instead of a summary or a final presentation of some conclusions let me describe the most prominent issues of quality circles which we think might contribute essentially to the improvement of the teaching practice component of TE and the professional service of cooperating teachers (F.BUCHBERGER 1995, F.BUCHBERGER/K.BYRNE 1995):

(a) Orientation on permanent improvement in small steps instead of an orientation on large innovations.
(b) Permanent improvement in small teams which may be defined as learning systems.
(c) These small teams permanently solve concrete problems and they themselves take responsibility for both processes and results.
(d) Permanent improvement activity is defined as an integral component of the working load/working time.
(e) Coordination and systematic linkages between the small teams within an institution.
(f) Coordination between the teams and the strategic management.
(g) Flat hierarchy both
    * within the teams and
    * the teams and the (strategic) management.
(h) Moderation of the improvement process both by consultants from within the institution and by external consultants (especially at the beginning of improvement processes).
(i) Orientation on the needs of clients/students/schools.
(j) Use of most recent (scientific) knowledge and technologies.

Using these principles TE might become a powerful learning environment for student teachers, university supervisors and cooperating teachers. Changes of perceptions on the role of cooperating teachers and university supervisors seem to be a necessary condition for improving the teaching practice component of ITE in particular and the entire system of ITE in general.

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Teacher's Purposes and Student's Intentions. Do They Ever Meet?

Pertti Kansanen

1 The teacher

To be a teacher means to work in some institute with some students in order to bring about learning or some other forms of changes in the personal development of those students.

The mental bounds of teaching are composed of the curricula which teachers must follow. That is, however, not enough; the curriculum is always a part of a broader social context. Although teachers are assuming an increasingly larger role in planning curricula, the degrees of freedom in planning are not indefinite. The broad boundaries are usually defined outside the teacher's sphere of influence, but the teachers themselves develop the curriculum as it is carried out in practice. In this way teachers can integrate their own values into the curriculum from the very beginning so that it is more in line with their own thinking than when the curriculum was more or less given. In any case there is a discrepancy between the values of broad curriculum and the values the teacher brings into the curriculum and into the instructional process. This discrepancy is not often noticed because both sources of values are probably based on the same framework and because teachers' values are mainly subconscious. Often this discrepancy is no discrepancy at all if the broad lines do not contain any exceptional aims or goals.

In any case there are some organising themes or basic principles behind the curriculum which may be called purposes. Logically, the aims and goals must be in harmony with the purposes. The system of aims and goals form a totality where all parts are related to each other. When the form and content are brought into this system no such elements are possible which are in conflict with the totality. In a way this totality is an ideology whose content may vary from religious to political doctrines with all their variations. According to this metaphor the teacher must be inside this ideology to be able to act accordingly. To follow the idea further the teacher is a representative of this ideology and cannot act against it. His/her mission is to lead the students to adopt the doctrines of the ideology.

This metaphor can also be applied to the contemporary conception of the curriculum although the content is conceived as consisting more of knowledge and beliefs than of ideological substance. In any case, the teacher is the same representative of this totality as before and an expert in the content of the curriculum which is designed to bring about learning in his/her students. With this example in mind it is easier to understand the dependence of teachers' activities on the values of the curriculum. To attain commitment to the values of the curriculum, the teacher's own values must gradually become harmonised with these. This is presumed to happen through the following phases of development:

1. *The teacher must become familiar with the values of the curriculum.* In practice this means to become acquainted with the purpose, aims, goals, and objectives of the curriculum. The process of making the curriculum as teachers' own undertaking guarantees more than before the expert knowledge of the curriculum content. This first phase may have been problematic earlier when some committee produced the whole curriculum, which teachers were supposed to become familiar with during their work using it as a guide or through textbooks. When teachers are given only the broad framework of the curriculum they are compelled to reflect on and deduce the more concrete aims and goals. This means that getting acquainted with the values is unavoidable. The smaller the units of the curriculum become, the clearer the whole system is supposed to become. The inevitable consequence is that the teacher must have a good knowledge of the purpose, aims, goals, and objectives of the curriculum. Thus it is highly probable that the first requirement is put into practice.

2. *The teacher must accept the values presented in the curriculum.* Earlier when the aims and goals were introduced from outside, the process of accepting them could be problematic. The new approach presumably guarantees the acceptance of the aims and goals during the early stages of writing the curriculum. At least the possible discrepancies between the guidelines presented in the framework of the curriculum and the teacher's own values become obvious. In any case, this phase presupposes active reflecting, and adapting to the values can begin in due course. In extreme cases the teacher may become disillusioned and leave the profession. Another solution is to start to fight against these values. This may happen when the teacher has a strong conviction

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and sees it as his/her duty to act according to his/her own values. This inevitably leads to conflict and perhaps to serious consequences. If the teacher understands his/her mission in this way s/he may justify it e.g. with the principles of critical philosophy, the intent being to change practices and to achieve a new understanding of the curriculum and thus a new conception of the school.

In some normative systems of education the selection of a teacher is determined by the special values of the curriculum. It is highly exceptional for a teacher who does not accept the system to apply for a position. It is also natural to leave if the acceptance of a system becomes impossible. A good example is a school where activities are based on a religious curriculum. In state controlled schools the political system of the society also defines the values behind the curriculum. Most often these are so extensive that no problems occur. There are, however, a large number of examples from totalitarian countries where the teachers have no choice.

In a democratic society it is usually natural to accept the values behind the curriculum.

3. *The teacher must internalise the values of the curriculum.* Is not necessarily enough for the teacher to know the values behind the curriculum and to accept them. Without personal commitment the instructional process may be directed from outside. This can happen through using various ready-made teaching materials and if this is combined with a weak knowledge of the content, the process according to von Wright (1971, 57-60) is bound to become quasi-teleological in character.

There is a special difference between intentions and purposes when defining the terminology. All the participants in the instructional process have intentions of their own. The quality of these intentions is of a different character in the teachers' thinking compared with the students' thinking. The students come to the process with their expectations and are more or less motivated to study according to the curriculum. Teachers also have their own intentions. As Clark and Peterson note (1986, 273) some of them may be highly personal and have nothing to do with his/her teaching. It is, however, the intentions of the teacher that define the intentional situation in the instructional process (Pearson 1989, 65-71) and that is why it is important to try to combine the teacher's intentions with the purposes of the curriculum. If that process succeeds, thinking can be labelled purposive, and the teacher has internalised the aims and goals of the curriculum.

It is the responsibility of the teacher to plan and guide the teaching-studying-learning process. The instructional process deduced from the curriculum presupposes following the aims and goals expressed in the curriculum. This may happen in various ways. Internalising the aims and goals of the curriculum is often presented as an ideal means to fulfil the teacher's sense of mission. This is partly true; the spirit of the curriculum is thus realised as fully as possible. It brings with it, however, a paradox concerning the teacher's freedom to act in the instructional process. The more s/he is committed to realising the curriculum and to following its ideology the less freedom s/he has. On this basis it is justified to claim that purposiveness may become a threat to teacher autonomy. How is it possible to act autonomously in the instructional process with the aims and goals of the curriculum as an integral part of one's own thinking? The teacher is in danger of losing his/her critical mind and adapting him/herself to unproblematised thinking. A logical conclusion is to try to internalise the aims and goals of the curriculum in while maintaining a critical attitude towards decisions that are behind his/her/her pedagogical thinking. How this is possible depends on the readiness for autonomous reflection and conscious decision making where all the alternatives are taken into consideration.

2 The student

The pupil cannot only be a learner; a much wider role of a student is needed.

The activity of a student consists of studying that which is expected to bring about learning and other planned changes. Studying is conscious activity that is supposed to take place according to the lines and purposes expressed in the curriculum. The desired learning is thus context bound and that kind of change intended in the curriculum. It could also be called school learning. That is why the role of the pupil is not only to be a learner but also a student. To learn something needs doing something for it. Another issue is that much more learning is taking place than is defined in the aims and goals in the curriculum.

Participating in school studies is not voluntary, nor is it a responsibility for the student in the same way as it is for the teacher. Students in the school are of various ages and the desire to participate varies accordingly. The younger the students the fewer problems in motivating them. With older students motivation itself often becomes an independent phase in the instructional process. Gradually the students bring more and more of their own intentions into this process and these are usually well in line with the aims and goals of the curriculum. The crucial point, however, is that studying presupposes some kind of motivation. Without motivation studying becomes impossible. Although this extreme situation is infrequent, motivation can vary between very low and very high levels. It is common to divide motivation into different categories which interact closely with each other: extrinsic and intrinsic motivation.

A great deal of our learning happens through extrinsic motivation although its status in pedagogical literature is not entirely positive. It is, however, unrealistic to expect that a student would be intrinsically motivated all the time and with everything presented in the curriculum. Every person has his/her own interest areas and would, perhaps, drop courses of study which s/he does not like if it were possible. Many external reasons, however, may reinforce the motivation to study subjects, unpleasant or not, which the student sees useful in the future. Foreign language may be such a subject. It is not possible, however, to speak here about intentional studying in the sense of its very meaning. The intentions come from outside and are not part of the student's own endeavours. This is the usual situation in school and it is understandable that while pupils are children or youngsters they are not yet ready to take responsibility for their own studying. Naturally, the pupils have intentions to do something in school but in these circumstances these intentions are not the same as the purposes, aims and goals of the curriculum. The activities might be meaningful from the viewpoint of the pupils, but without extrinsic motivation they would eventually cease. The other alternative, however, is always possible because the instructional process is much like indoctrination (McClellan 1976). In the long run the student can also develop an interest for content that s/he found uninteresting in the beginning. Extrinsic motivation may thus become intrinsic. It is nevertheless unrealistic to expect it to happen in all cases, which is why both extrinsic and intrinsic motivation are always present. From the student's point of view, some of the aims and goals of the curriculum never unite his own intentions and studying cannot be called purposive although it may be called intentional in its ordinary meaning.

Development toward purposiveness requires a personal commitment to the studies. This presupposes the same phases as with the teacher's purposiveness but expressed in another way. While the responsibility of teaching is guiding the activities of the teacher in becoming acquainted with the aims and goals of the curriculum these must be presented to the students usually by the teacher. Somehow the aims and goals must be justified so that the students become motivated. In addition to extrinsic motivation, the aim is to elicit the active interest of the students, the ultimate goal being intrinsic motivation. The justification behind intrinsic motivation is that the aims and goals of the curriculum are internalised so strongly that the activities of the students can be called not only intentional but also purposive.

Intrinsic motivation and purposiveness may be seen as the same phenomenon looked at from different angles. When studying is guided by intrinsic motivation it is in line with the curriculum. In other cases the studies must be motivated extrinsically while the teacher tries to increase purposiveness in his/her students. Although this developing is considered mainly cognitive, affective and emotional factors are closely involved in this process. In intrinsic motivation the decision to study according to the aims and goals of the curriculum is not conscious and it is presupposed that intrinsic motivation cannot be transferred from one content area to the other. This is why purposiveness is needed in the teaching-studying-learning process with all students almost all the time. Knowledge of the nature of intrinsic motivation may be useful with ordinary teaching models, where purposiveness is thought to consist of: becoming acquainted with the aims and goals, interpreting and accepting them, and, finally, internalising them. Combining the process of becoming purposive with intrinsic motivation is using both sides of the phenomenon to reach the ultimate goal.

The central concepts in the analysis of intrinsic motivation as expressed by Byman (1995) are curiosity and interest as a basis for intrinsic motivation. In the teaching-studying-learning process teachers often use short-term motivation to arouse interest with some unexpected detail that is peculiar to the content to be studied. This may be wholly extrinsic but all teachers must know that motivation accomplished this way does not last long. If curiosity is aroused by some aspect of the content the rational elements of getting the students motivated are directing their attention. The meaningfulness of studying is emphasised in this way. Curiosity in general (Byman 1995, 36-42) has very little significance; the same can be said about perceptual curiosity. Berlyne (1965), however, introduces some applications that are based on epistemic or specific epistemic curiosity and considers them suitable, especially for science teaching, where it is easy to find surprises or paradoxes (Kansanen 1986, 142-143; Byman 1995, 38-39).

A variation using specific epistemic curiosity as a means of arousing motivation is subject-matter directed motivation (Kempf & Lehrke 1975; Lind 1976). According to this idea studying should be based on content-centred motivation. With intrinsic motivation the activity itself may be emphasised too much and the aims and goals of the curriculum not taken into consideration enough. Subject-matter directed motivation is, however, mainly one kind of short-term motivation which, most certainly, has all the possibilities of developing into intrinsic motivation focusing on some subject-matter. It is, however, unrealistic to believe that the students would become involved in all subject-matters in that way.

The rational side of studying based on curiosity, interest and intrinsic motivation is being purposive in terms of the aims and goals in the curriculum. A teacher's task in the teaching-studying-learning process is to motivate the pupils so that they may be called students. It is very difficult to find any standard procedures leading to purposiveness but one alternative that has proved to be promising is joint planning of the teaching-studying-learning process (Komulainen, Kansanen, Karma, Martikainen & Uusikylä 1981). Including the students in the beginning of the planning process gives them more responsibility and is justified by the content of the curriculum. When asking the very special question "why" the students are brought together to think about the essential elements of their own education. That is, principally, the core idea of purposiveness from the point of view of the student.

It is not difficult to find evidence for increasing intrinsic motivation through various experiments (e.g. Cordova & Lepper 1996) but usually the approach does not try to get long-lasting effects. On the other hand, theoretically the idea of using intrinsic motivation as a basis for rational decision making is seen in Deci's writings. The concepts of self-determination and internalisation (Deci & Ryan 1985, 1994; Deci, Eghrari, Patrick & Leone 1994), when brought into school pedagogy, greatly resemble the principles of purposiveness. In Deci's writings there is an attempt to refer to both types of motivation; self-determination combined with extrinsic motivation is claimed by Deci and Ryan (1994, 11) "to positively predict high quality learning and personal adjustment in school". It is interesting to note that the approach based on intentions and particularly on aims and goals in the curriculum has much in common with the approach coming from research on motivation. Further, it is highly interesting that the social context in this research is also the classroom and school. In this respect the context in both approaches is principally the same.

3 Interaction – encounter or mutual understanding?

Teacher-student interaction is asymmetrical. The moment it becomes symmetrical there are no more teachers or students.

The ideal form of an encounter between teacher and students would be acting purposively in a mutual relationship, striving for attaining the aims and goals of the curriculum. At the same time this would be a very dangerous threat to the autonomy of both sides, both in relation to each other and in general. This would also mean that both parties were content with the curriculum and with the school on the whole. Usually there is room enough within the boundaries of the curriculum for the teacher to develop, criticise and reform practices.

Both parties bring different aspects with them into the teaching-studying-learning process. The teacher is responsible for guiding the studying of the pupils in the direction of the aims and goals of the curriculum. At the same time s/he must motivate the students to participate in the process. Most of the time the intentions of the parties are not the same. The degree of purposiveness also varies in the activities of the teacher. The situation may be quite paradoxical with the teacher directed by quasi-teleological forces, guiding the studying of the pupils, whose intentions may be anything but the aims and goals of the curriculum.

Most of the problems concerning interaction in the teaching-studying-learning process arise from the fact that this process is part of a greater context and is situated in some institute, usually in a school. Adult education is a special aspect of this process where the relations of the participants are of a different character. Thus the teacher and the students are not free to do what they would like to do. Although the curriculum sets the boundaries for the activities, there is space to make decisions. Both parties have intentions of their own and life in school is planned in principle so that all the experiences during the time school is responsible should contribute to attaining the aims and goals defined in the curriculum. To fulfil his/her obligations the teacher must decide how to guide the teaching-studying-learning process. Getting purposive is internalising the aims and goals of the curriculum but this development does not happen automatically. At the same time the teacher's task is to get the students motivated and involved in studying. While the students' intentions seldom coincide with the aims and goals of the curriculum, growth in this respect is a prerequisite for getting purposive. Intrinsic motivation may be used in this activity but it is unrealistic to think that the entire content of the studies can be motivated in this way. Appealing to rational thinking and to the content of the studies is supposed to lead to increasing interest and gradually to purposive activity. A crucial question here is if this could happen to both parties jointly. In that case the aims and goals would be the joint content of their activity.

Hellgrén (1985, 21-25), leaning on the theory of social action by Raimo Tuomela, uses a concept of we-intention when explaining a common understanding of the direction of activities in the teaching-studying-learning process. An important contribution of this point of view is the notion that a teacher usually works with a group and the "we-intending involves a special form of consciousness which is the internalization of the concept group" (Hellgrén 1985, 22). We-intention may be considered an ideal condition for working in the teaching-studying-learning process. It may also be regarded as an extension of individual intention to contain all the participants in the process. In a context where the teacher acts purposively in interaction with students who have also internalised the aims and goals of the curriculum, the teaching-studying-learning process may be called purposive as a whole. This special condition of joint activities also fulfils the criteria of we-intention. In practice, however, the degree of purposiveness varies among students and with the situation and circumstances. (Yrjönsuuri 1993, 41-51.) The most common combinations may be described as follows:

High level of teacher's purposiveness	Ordinary	Purposive
Low level of teacher's purposiveness	Mechanic, quasi-teleological	Interest-based
	Low level of student's purposiveness	High level of student's purposiveness

There are two cells where the intentions of both the teacher and the students are in line with each other. The ideal condition for joint activities is represented when both parties are purposive and have internalised the aims and goals of the curriculum. The condition can, perhaps, be described on basis of we-intention. How advisable this condition would be is not unambiguous. Another cell where the intentions are in line with each other originates from the condition where both parties have a low level of purposiveness. Both teaching and studying can be said to be mechanistic and technological without personal involvement. Supposedly extrinsic motivation is in use and the working atmosphere is probably perfunctory. The conditions for studying and especially for learning are not favourable. The teaching-studying-learning process is controlled by quasi-teleological systems.

A high level of purposiveness on the side of the teacher combined with a low level of purposiveness on the side of the students is probably the most common situation in school teaching. The teacher feels that his/her responsibility is to follow the aims and goals of the curriculum as well as possible but the students' intentions are not in line with the curriculum. It is the task of the teacher to get the students to accept the aims and goals and finally to internalise them. As long as this is not the case the teacher is compelled to use only extrinsic motivation to get the students to study.

The opposite condition exists when teachers have a low level of purposiveness while students have a high level. This may happen when students or at least some students are intrinsically motivated and interested in some content as such. The origin of intrinsic motivation probably derives from personal interest and the activity is usually practised outside the school as well. It is highly plausible that this kind of intrinsic motivation is not present all the time and in all subjects and is not of much use in the instructional process in general.

4 The dark side of pedagogical virtue

Fulfilling the ideal requirements is a threat to teacher autonomy.

Theoretically purposiveness and intrinsic motivation are qualities worth aiming at. Perhaps the effort to achieve conditions where teaching and studying may be considered optimal is to be desired. Another question is how desirable this state would be. To become involved in something or to internalise values also contain dangerous qualities and may be a risk to independent thinking. Internalising something of value is to take a stand in favour of it and at the same time against other values. Acting according to aims and goals decided by others presupposes a critical attitude in order to develop and improve the practice when needed. Following the authorities too strictly is likely to diminish the inclination toward autonomous development.

The traditional conception of teaching and teacher's work has been justified by a calling or a sense of mission. It is obvious that the essence of it has often been religious in nature and teaching has been a form of charity. Reading, writing and arithmetic have been a means to a better life and a way to become acquainted with the origins of the value systems of those who have been responsible for the teaching. The moral basis of the aims and goals has been deontological, where a strong feeling of responsibility for moral values has been a requirement of the teacher's work. Internalisation of the aims and goals has been natural for the teachers. Adapting the educational program through internalisation comes close to indoctrination in this case (McClellan 1976). No criticism against these basic values is possible and the teacher loses his/her freedom to think and act autonomously as well. The teacher is acting inside *doxa*.

The position of teaching and the teacher is no longer as dependent on external value systems as before but similarities to this kind of commitment still exist in the modern curriculum. The teacher is working inside the curriculum and inside its value boundaries. The present curricula also vary from highly value-bound to pluralistic but the teacher can usually seek alternatives. In the case of purposiveness a distinction between cognitive and affective content is fruitful. With cognitive content it is easier to keep distance and think rationally. However, teachers are often specialists in their subjects and may gradually internalise their importance beyond other parts of the curriculum. Affective content is, however, more problematic; it usually requires a personal standpoint. Becoming acquainted with the content, accepting it as positive and finally internalising it are all evidence of commitment to those values. It may be claimed that with commitment to the values of the curriculum the teacher is no longer autonomous but is promoting those values in the students' thought processes. After taking a stand, changing the curriculum and, above all, independent thinking is of utmost difficulty.

Would it be possible to speak of rational internalisation? Combining these two concepts is like composing a paradox. Or would commitment instead of internalisation be enough to achieve purposiveness? In any case the process of becoming purposive requires conscious control and criticism. Perhaps a conscious and rational commitment is possible. Or would it be better to use self-determination and bring purposiveness closer to motivation in the teacher's work as well?

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On Some Psychological Contributions to Theory and Practice of Instructional Design

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Introduction

It is perhaps considered trivial to declare the links between psychology, on the one hand, and educational and instructional sciences, on the other hand. However it is hardly trivial to discuss specific functional interrelations between them. Considering the educational and instructional sciences as the "consumers" of psychological knowledge the following question may be asked: What type of psychology do the educational and instructional sciences need? This problem is very important for contemporary Instructional Design (ID) theory and practice. An instructional designer is not in need of general speculations but, rather, needs concrete information on the psychology of learning, development, and instruction which might become the core of an Instructional Design knowledge base. One may say that recent Instructional Design research has created a real challenge for psychology. That is the challenge of providing knowledge which is sensitive to the heterogeneity and complexity of the social context in which learning processes take place while at the same time offering to the instructional designer sufficiently concrete and clear psychological descriptions both of students and of the learning/teaching processes and contents. This challenge has become even stronger after the fundamental reorientation of the Instructional Design movement from the behaviourist to the cognitivist paradigm. There is now an emphasis in Instructional Design on the active, constructive and contextualized nature of the learning processes. Thus, the *active* and *constructive* nature of a learner's performance, *meaningfulness* as an important condition of learning , and the central and determining role of *internal* (vs. external, behavioural) paspects of learning processes such as *cognitive and metacognitive strategies, and mental schemata,* are the key elements of the newly created ID paradigm (Bednar et al., 1991; Briggs, 1982; Dijkstra et al., 1990; Elen, 1992; Gagne & Merril, 1989; Glaser, 1990; Lowick, 1992; Merril. 1991; Pirolli & Russel, 1990; Reigeluth, 1989, 1993; and others). Accordingly, the main task for the new generation of instructional designers is now defined as that of the *creation of powerful and effective learning environments* (De Corte, 1990; Mandl & Prenzel, 1992; Dijkstra, 1997).

Modern cognitively based instructional design models and theories utilize concepts such as "self-directed learning", "student self-regulation", "meaningful content", "cognitive and metacognitive strategies" (e.g., Dijkstra, 1990; Mandl & Prenzel, 1992; Pieters, 1992; Terlouw, 1997). One might say that both descriptions of human learning, and prescriptions concerning planning and conducting teaching have recently begun to come closer to the real life requirements than did the previous behaviourist descriptions. At the same time, despite high public expectations concerning real, practical applications of the theories and models identified by instructional designers, the actual results seem to be far from satisfactory (Reigeluth, 1989; Salisbury, 1993; Snelbecker, 1987; Mandl & Prenzel, 1992). Ely (1990) has described this situation specifically with focus on instructional design for schooling (IDS). Ely notes that researchers wonder why teachers and school administrators do not want to use the results of their remarkable and sometimes outstanding ideas, theories and models. However teachers and administrators (together with public opinion) wonder why the researchers are not capable of providing them with practical, useful knowledge, expressed in an acceptable and understandable form in a way that it can be applied in everyday schooling activities. Ten years ago, Snelbecker (1987) has published a “menu” of teachers’ arguments justifying why they did not use ID’s prescriptions in their everyday professional activity. Evaluating the possibilities of the Instructional Design “blueprints”, several teachers claimed that they were already on their own practising what was recommended by IDS. Other teachers, while acknowledging the innovative nature of the ID recommendations, still doubted the practical possibility of applying the recommendations in their own classrooms. They made statements such as: "I don't need any help in teaching/training", "I am already doing what you advise", "If I use that theory I'll have to change my teaching methods completely", "I already know those theories". These and similar statements were found to be the most common among the teachers (Snelbecker, 1987).

There is a simple and obvious condition for any scientific knowledge to be accepted and used by practitioners. This condition is that one is able to do significantly more, both in explanation and in practice with such knowledge than would be possible on the basis of common sense or practical experience alone. Two steps are necessary to ensure that this condition is fulfilled. *First*, a **general intellectual procedure, or tool** should be identified that would not only enable users to analyse the many aspects of concrete schooling, training, or instruction situations in terms of modern learning and instruction science (ID is a part of it) but that would also attract them toward doing so. *Second*, the **rules of application** (implementation) of such a procedure to a real practical situation must be defined. There are psychological aspects (or psychological sides) related to each of these two steps. The psychological aspects of the *first step* belong the fundamental issues of human learning and developmental processes. The psychological side of the second step primarily relates to the conditions which facilitate or constrain an application of the fundamental knowledge in the actual schooling, training, and instruction practice.

A general intellectual tool for effective Instructional Design

A particular outlook, or attitude, is expected to be useful for the effective ID work. It might be considered an "intellectual tool" for ID, that is, as a tool to support the creative process of the instructional designer. Such a tool must be multi-functional and universal. It should to direct the attention of the users to the changes and development in the constructive activity of a learner, and to serve to focus user's attention on the mental, internal components of any learning activity. On the procedural (technological) level, such an approach must be sufficiently operationalized so as not to be simply a set of speculative declarations, or "good intentions". Thus, ID seems to require a much more strict, and simultaneously more explicit, form of psychological knowledge. That is, ID requires non-metaphoric descriptions of those variables (structural, functional and developmental) that are most essential and that determine the effectiveness and efficiency of learning/teaching processes, as well as the description of the interrelations of those variables. In addition, ID requires a very detailed and, again, non-metaphoric and unambiguous description of the psychologically grounded conditions that should be present within schooling (training, instruction, etc.) environments. Such descriptions must encompass the whole of the schooling situation and the complexity of the processes and phenomena involved.

It is important to emphasize that these descriptions must also be developmentally sensitive. Two principally different mechanisms may underlie a lack or even an absence of an ability to act in a mental plan : 1) macro-genetically, a learner's mental plan may be underdeveloped (Galperin, 1992; Piaget, 1970) and, hence, cause his/her inability to act mentally within specific spheres of reality; 2) micro-genetically, the mental actions that are the prerequisites for learning specific content may not have been formed at all (or may have been formed with inappropriate and insufficient properties) in the course of a student's past experience (Galperin, 1969). The developmental dimensions of instructional content are equally clear. For example, it is generally not possible to assimilate certain subject areas before a certain, identified age, or developmental point (Piaget, 1970). However, it is possible to overcome such age-related barriers (Galperin, 1992) when ID promotes the special formation of a student's mental activity based on functional development regularities.

In discussing the "developmental sensitivity" of modern ID descriptions, one has to distinguish two different aspects: First, the developmental dimension, as an essential and necessary component of the ID-knowledge base, must be taken into account in developing plans for instruction. This requires : (a) planning, designing, organising the learning/teaching processes in accordance with macro- and micro-developmental regularities, and (b) determining the short- and the long-term developmental consequences of these processes, and the extent to which learning/teaching processes influence the student's cognitive, personal, moral, social, and emotional development. Second, developmental changes can also be viewed as a direct and immediate aim of the learning/teaching processes. At a very general, philosophical manner it was formulated by L. Vygotsky as: "instruction is good only when it proceeds ahead of development" (Vygotsky, 1978).

Instructional design for schooling (IDS) is the sector of modern ID in which the "developmental sensitivity" is especially important and significant. IDS requires an explicit statement of those characteristics of the learning and instructional processes that are usually implicit for modern ID-scholars (ability to carry out a mental plan, capacity to build a cognitive or metacognitive strategy, etc.). This is, probably, the most serious and deep difference between ID per se, or "adult" ID, and IDS. If ID allows designers to limit themselves to a description and an organisation of the learning conditions under which the processes and properties (self-directness, mental schematizing, etc.) display and spread, IDS needs to describe the conditions to ensure not only the necessary changes of those processes and properties but also their planned and guaranteed coming into existence.

One example of an approach in which the above requirements for an ID general intellectual tool are met, and met in a sufficiently complete, sophisticated, and operationalized manner, is the "*formation of mental actions*" approach described by *Galperin* (1967, 1969, 1989, 1992, a.o.).

Galperin's approach is the continuation of a trend in developmental and learning psychology which was started by Vygotsky (1978). However, Galperin's approach introduces the following new elements: (a) the approach considers the nature of human mental life, its coming into existence, and its further development in the context of philogenetical, anthropogenetical and ontogenetical processes; and, (b) it considers the system of psychological conditions which enable knowledge and skills formation with the desired and prescribed outcomes. According to Galperin's approach, mental action is a functional structure that is continually being formed throughout an individual's lifetime. Using mental actions, a human being plans, regulates, and controls his/her performances by means of socially established patterns, standards and evaluations. Mental action can and should be considered as the result of a complex, multimodal transformation of initially external processes performed by means of certain tools. In other words, from a nomothetical point of view, concrete mental actions and images are the results of the internalization of external processes (Galperin, 1967).

Mental actions and images reflect, and are the product of, both human needs and the demands and conditions of the objective situation. They can, therefore, be characterized by a set of primary and secondary properties. The following properties are considered to be *primary*: (a) the composition of the action's objective content; (b) the extent of differentiation of essential elements of problem situation from non-essential elements within the problem situation; (c) the degree of internalization of the action; and, (d) "energetic" (speed and enforcement) parameters. *Secondary* properties are: (a) reasonability; (b) generalization; (c) consciousness; and (d) criticism. The secondary properties are the result of specific combinations of primary properties. Both primary and secondary properties represent socially estimated and evaluated qualities of human activities, and refer to any sort of activity, whether individual or collective, material or mental.

The final values of these properties determine the specific action and/or image that is formed. Galperin considered the values of the properties to be the direct outcomes of action formation conditions. He therefore defined a system of conditions that ensure and guarantee the achievement of prescribed, desired properties of action and image; this system is termed the "**System of planned , stage-by-stage formation of mental actions"**, or the **PSFMA system.** The PSFMA system includes ***four subsystems:***.

(1) the conditions that ensure adequate motivation for the subject's mastering of the action; (2) the conditions that provide the formation of the necessary

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orientation base of action; (3) the conditions that support the consecutive transformations of the intermediate forms of action (materialized, verbal) and the final, end-transformation into the mental plan; and, (4) the conditions for cultivating, or "refining through practice", the desired properties of an action (Galperin, 1989). Each subsystem contains a detailed description of related psychological conditions, which include the motivation and operational areas of human activity.

The *first* subsystem (conditions for motivation) makes explicit a number of links and connections between learning motivation and the dynamics of the internalization processes.

The *second* subsystem (conditions for orientation) contains a description of hierarchically organized components which together offers a framework for the formation of a concrete action and provides a learner with the conditions for an adequate ("complete", by Galperin) orientation within a problem situation. Those components are the representations of the subjective and objective characteristics of a problem situation and taken together were termed by Galperin the "complete orientation basis of action" (Galperin, 1992) (See Figure 1)

Figure 1. Structure of complete orientation basis of action (Galperin, 1992)

1. **Representation of the final product of an action**
2. **Representation of intermediate products.**
3. **Representation of the general plan for achievement of the final product.**
4. **Representation of plans for achievement of the intermediate products.**
5. **Representation of tools used to achieve those products (both orientation & execution tools).**
6. **Representation of the plan and tools for control and correction of actions as they are being executed.**
7. **Representation of the entire structure of a complete orientation basis of action.**

The third subsystem represents the stages of internalization, or transformation of the action into a mental plan. Galperin has introduced *six stages of internalization* as the fundamental basis of any learning process (see Figure 2):

Figure 2. Stages of mental action formation (Galperin, 1967)

1. **Formation of a motivation base of action.**
2. **Formation of an orientation base of action.**
3. **Formation of the material (materialized) form of action.**
4. **Formation of the external socialized verbal form of action (overt speech).**
5. **Formation of the internal verbal form of action (covert speech).**
6. **Formation of the mental action; final changes, the action's automatization and simultaneouzation.**

The last, and *fourth,* subsystem contains a description of the three base problem situation types, and of their combination and presentation during the formation processes. Three basic types are distinguished: (a) the "*psychological*" type in which the conceptual and perceptual or visible features of a problem situation are contraposed; (b) the "*logical*" type, in which necessary and essential parameters are contrasted with unnecessary, or "noisy" parameters of a problem situation, and (c) "*object*" type, in which all the possible forms of a specific action object content are varied. Different problem types are offered in a sequence which is meaningful for learners.

If the four subsystems harmoniously work together, they produce an action with the desired primary and secondary properties.

To describe the frames of that approach generally in terms accepted by contemporary instructional design scholars, one may say that: (a) *instructional content* is presented as a set or a system of interconnected actions, concepts and representations planned to be formed; (b) *goals of instruction* are defined and specified in terms of action parameters; (c) *instructional plans* are elaborated as didactic projections of stages of formation; (d) *learners' characteristics* are first considered in terms of the students' motivational and cognitive readiness to acquire projected mental actions and concepts.

Looking through the history of Galperin's approach, one can see the periods of great optimism regarding the effectiveness and efficiency of the approach. Indeed, it seemed to be possible to transform radically the methods, as well as the traditional results, of the learning/teaching process using this approach. As has been convincingly demonstrated by hundreds of experimental and applied studies, a whole set of main objectives that are the goal of any schooling effort have been fulfilled through this approach. These are, for example: (1) the *guaranteed acquisition* of the curriculum by *all learners* with the necessary level of preliminary knowledge and skills. This can be achieved without prolonging the time allocated, and with essentially no additional cost; (2) *the separation of instruction* into the acquisition of knowledge and its application *is minimized* or wholly disappears; (3) learners acquire *abilities and are able to transfer* these to new situations. They transfer not only knowledge and skills, but also process for acquiring new knowledge and skills; (4) by becoming aware of these newly formed abilities, learners become *more and more interested* in the processes of acquiring knowledge and in knowledge itself (Galperin, 1989; Podolskij, 1993).

Despite these promising findings, systematic and extensive application of this approach is absent thus far. Of course, there are many interesting examples of the use of PSFMA in different parts of Russia and outside of Russia as well, which demonstrate the successes, failures and problems of the system when put into practice. However the use of the PSFMA system is still limited. In addition to the obvious social-economic and social-psychological reasons for this limited use, there is also a more theoretically based reason, one which concerns exists one, which has a theoretical nature concerning the ways and means by which Galperin's approach is put into practice.

On the use of a general intellectual tool

Historically, it has been established that in most psychological investigations conducted along the lines of the approach discussed here, first the successes of the PSFMA came to the fore. However, the proponents' enthusiasm concerning the unusually hopeful results had a negative side: It led to a serious *misunderstanding* concerning the position of Galperin's approach. The approach has been mistakenly interpreted not as a general description of laws and regularities to explain the concrete dynamics and results of human mental activity formation, but rather as a set of technological principles and prescriptions regarding how to teach. Such an interpretation, indeed, distorted the reality and transformed the approach to some "absolute" knowledge as a sort of "philosophers' stone". One has not to forget that any scientific research ("pure" scientific research or practically oriented) is always based on a certain system of abstractions accepted. A direct use of research methods, created on the basis of such abstractions, has a number of fundamental restrictions.

The heterogeneous structure of a real learner's orientation in the problem field, in the instructional situation as a whole, in learner/teacher and learner/learner interrelations, and the non-linear character of an action's orientation formation preclude speaking about an application of any constant, or, so to speak, "absolute" PSFMA procedure (see: Podolskij, 1989, 1990, 1991, a.o.). The sequence of stages, the general structure of the orienting basis of action and other cornerstone elements of the planned stage-by-stage formation system mentioned above, should be considered as the most complete, normative and, according to Galperin, the *nomothetic* description of human mental action formation process (Galperin, 1992; Podolskij, 1994).

In emphasizing the nomothetically orienting role of the general PSFMA system, the successful application of the PSFMA statements does not imply a literal reproduction of some abstract general procedure. Rather, it refers to the creative design of a system of necessary and sufficient psychological conditions for instruction. The elaboration of such a procedure occupies an intermediate position between fundamental psychological knowledge and the real process of schooling, instructing, or training (Podolskij, 1993, 1997). This intermediate position is operationalized in the consecutive elaboration of **three models of the instructional situation.** These are *the psychological, the psychological-pedagogical, and the methodical, or technological model* (Podolskij, 1993).

The psychological model includes: (1) a description of the knowledge and skills to be acquired in terms of the learner's mental actions, images and concepts; (2) a description of the macro- and microstructure of the learner's orientation as the basis for a new mental action, concept or image to be formed; (3) a description of age-related and individual characteristics of students that are relevant to instruction and schooling; and, (4) a description of the specific system of psychological conditions needed for the formation of the planned action. It is clear that in different applications of the PSFMA system application emphasis should be placed on different constituents of the psychological model.

The main function of the *psychological-pedagogical model* is the projection of the demands of the psychological model onto the specific objective and subjective conditions of schooling and teaching. Those conditions include: the organization of instructional activities and the distribution of different organizational forms during a lesson or a sequence of lessons; the proportion of in-class versus homework activities; and the proportion of individual versus small group and whole class collective forms of learning activities; and the use of available technical aids for teaching (including computers).

The last, *methodical, or technological model,* of the instructional situation includes a detailed description of the process of teaching, defined for units of definite form and time, with a precise description of the goal of each unit and the means to achieve that goal. It also includes a complete list of teaching documentation: schemes, different kinds and types of both learning and checking tasks, descriptions of the order of application of technical aids, and a number of other materials specified for different types and kinds of schooling or instructional situations. The methodical model looks like the traditional well-done "teacher's lesson plan"; however, one has to remember that this model is based upon the considerations outlined by the psychological and the psychological-pedagogical models (Podolskij, 1993, 1997).

Considering the three-model framework, it is again necessary to emphasize that this is also an intellectual tool. It is not an algorithm which prescribes "how to act". This framework, if used in an appropriate and sophisticated way, gives a teacher the ability to orient, to plan, and to control him(her)self completely and correctly in designing, arranging and carrying out different instructional activities.

On the psychological issues in implementation of an ID product: the INTINDET case

The **Int**egrated **In**structional **D**esign **T**echnology (INTINDET) introduced by Terlouw (1993, 1997) appears to offer an adequate framework for considering the psychological issues as well as the practical implementation of ID products. An example of an INTENDET application can be found in some elements of the curriculum design and of the procedure of retraining within a program for unemployed persons in the Obninsk city, Kaluga region of Russia. The training program was designed to provide entrepreneurship skill to a group of highly educated, unemployed persons.

The INTINDET approach presupposes a systemic consideration of both the object and the activity of ID. The object of the design in the Obninsk case mentioned was complicated and multilevel. The final goal of the design activity and of the design product's implementation seemed to be quite traditional in that it was to retrain people who were employed in the military industry so as to assist them to in finding new civil occupations.

Manufacturing the ID product, one has to take into account the parameters of management and administration of the instructional-learning processes as such (the *tactical* level according to Terlouw) and even the peculiarities of the social policy of local and regional authorities (*strategic* level). These levels of complexity of the ID object may be considered to the comparable to the levels of complexity of human interaction within a society: (a) individual; (b) organization; (c) a network of organizations.

All the essential statements pointed out concerning adult learning and instruction are completely applicable and suitable for the type of students trained in the Obninsk group. They demonstrated an active and constructive learning processes as well as different types of knowledge representations and mental models; the students were self-directed learners who actively participated in the creation of their learning environments. The students were generally the 30-45-year old higher educated women with a relatively long professional (engineering, management) experience, and from 1 to 6 months duration of unemployment. Thus, the age- and sex-related characteristics were also present as well as individual-psychological characteristics (see: Brown a.o., 1989; Bruijn, 1993; Pieters, 1993;). At the same time, there were, however, some key, additional factors to be considered. The first factor was related directly to the students' educational level. Since all of the students were people with higher education, their occupational aspirations and expectations did not correspond at all with the reality of the local and regional placement possibilities. Only 12% of the existing vacancies required a higher education and no more than 7% of them were intended for women. The second factor was the very strong and consistent emotional tension (in some cases, with elements of depressiveness) which characterized practically all of the students (Idobaeva, 1995). The third factor was the social-economic situation in Russia and, in particular, in the Kaluga region. In addition to the usual difficulties faced by beginning entrepreneurs in any country in the world, the Russian entrepreneurs meet with a set of specific serious problems, such as: (a) an absolutely unreasonable level of the state and regional taxation which does not stimulate and, in fact, discourages an entrepreneur's initiative; (b) the constant risk of attack by criminals; and, (c) the unpredictability of the market and of its development.

As the students are people with high levels of general and special intellectual capabilities, and rich real-life experience as well, they have no illusions concerning their situation at this current stage in the dramatic Russian history.

It is quite clear that these students' characteristics must influence significantly the design of the instruction, and the forms of the implementation of training course. *First*, the higher (value, sense, and goal) levels of the newly formed orientation in the topic studied should be designed (and then acquired) beforehand, and only after it - the lower, executive orientation (see Podolski, 1993). *Second*, it appears to be practically impossible for the students to enter the training procedure without some initial relaxation procedure, especially one designed and organized on the basis of the preliminary investigation of the individual psycho-physiological, somatic, emotional and personal status carried out by a medical doctor (Idobaeva, 1995). *Third*, it appears to be necessary to identify, as clearly, and as unambiguously as possible (*to materilize* according to Galperin, see Galperin, 1992), the links between the representations of the students concerning the sources of their real-life difficulties and specific and realistic programmes for overcoming those difficulties. Taking into account simultaneously the high intellectual potential and the negative emotional status of the students, such a demonstration should be carried out very convincingly. *Fourth*, it is possible to speak about the positive results of the training (especially looking ahead) only in the case when the main goal (satisfactory placements of the students) is achieved.

It is not difficult to see that the design of the curriculum in the Obninsk case combines Terlouw's different levels of elements in its subject matter: (a) it's impossible to avoid a consideration of the political, legal and administrative determinants of the students' real-life problems; (b) the training process should built trust among; (c) the instructional-learning processes have to be designed and carried out by the most effective means, taking into account all of the student characteristics and the characteristics of the training situation.

Such a difficult task may be solved only by specially trained designers and teachers whose competence must combine both traditional educational and instructional skills with substantial knowledge psychology psychological and even psychophysiology and, sometimes, medicine.. Both the designers and the teachers must also be very aware the current local social-economic and employment situation. Thus, special teachers, such as the vice-Mayor of the city and successful local entrepreneurs, are involved in the training process to increase the reliability of the information given.

The curriculum design consists of the following parts; these correspond to the stages of the training procedure.

A. *General stage.*

Preliminary stage. Psychological and psychophisiological examination by a psychologist and/or medical doctor.

1st stage. Psychological relaxation.

2nd stage. Analysis of the internal and external situation: What happened inside and outside of the students when they become unemployed.

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3rd stage. Analysis of the realistic and unrealistic, constructive and destructive approaches to resolution of the problems that appeared.

B. *Specialized stage.*

1st stage. Formation of the general occupational intention, which has to be concrete and realistic, locally or regionally appropriate.

2nd stage. Preparation of a package of the documents for the starting entrepreneur, including materials such as market analysis, business plan, and financial plan. (Materials that were prepared by C.Terlouw and Foundation "Activa" (Enschede, The Netherlands) were used in the design and implementation of this stage of the training, see: Terlouw, 1994).

C. *Evaluation stage.*

1st. stage. Analysis of the students' successes and failures while applying the acquired content.

2nd stage. Providing objective feedback to students on their performance.

The whole procedure (including the third stage) takes one-half year to be implemented and to demonstrate preliminary (but nevertheless real) results. The first two stages take two months. This is a relatively short period of time compared to similar training experiences in Western European countries; this is likely due to the higher educational level of our students.

Thus, using the revised Galperinian approach as the fundamental background, and Terlouw's INTINDET scheme as the model for the implementation, we design a procedure to create a system of necessary and sufficient psychological conditions that:

(1) develop a heterogeneous student orientation (the value, the sense, the goal, and the executive levels of orientation) in the internal (psychological) and external (social-economic) situations. One of the important element is a positive psycho-physiological status of the students. Another important element which belongs to the higher (value and sense) levels of a student orientation, is an internal personal trust of the information given and, accordingly, knowledge acquired;

(2) ensure a stage-by-stage transition (*internalization* by Galperin) of initially materialized, external student orientation into the mental plan (different forms of schematization, discussion, problem solving are used to do this);

(3) to provide a developing orientation with such desired properties as reasonability, generalization, and criticality (see above).

Both in the first stage of the training course and in its second stage the students indeed created their newly acquired knowledge and skills. This came about through close collaboration with the teacher and with each other. They never played the role of the "pupils" and only sometimes of "apprentices". The majority of the training (with the exception of some of the first stage) was organized as a collaboration of specialists (psychologists, local authorities, entrepreneurs) and the students. This approach to the conduct of the classes was appreciated by the students.

On some psychological conditions necessary for successful implementation

As was emphasized above, practical application of the ID products requires a renewed multilevel analysis of the environment. This environment differs from the "powerful learning environment" frequently mentioned in the related ID literature (De Corte, 1990; Mandl & Prenzel, 1992; a.o.). In this sense, it seems useful to distinguish between *quasi-practical* application and *real practical* application of the scientific knowledge achieved. The last, real practical application presupposes an estrangement of the ID product from the creator and a wide-scale practising. Anyone who is experienced in working with instructional innovations knows very well that to elaborate a curriculum and procedure, to prepare teaching materials and new software is less than one-half of the practical solution. The other, and perhaps psychologically more difficult half consists in preparing (more often, in changing) the social psychological environment to enable the application of the innovation. This problem has a multilevel character, thus I shall shortly touch here on only one, however, the most important side of it. This concerns high-level manager understanding and acceptance of the idea of an instructional innovation as such, and their agreement with the probable changes in their own responsibility for the information and promises given. Sometimes, as practical experience shows, that understanding and acceptance comes into conflict with some managers' internal motives, or with their initial representations and judgements about the training for the unemployed.

Any serious real practical training innovations provided by the described training certainly presupposes that a high-level manager should able to consider such innovations from a systemic point of view, that is, in the context of complex interconnections of economic, technological, social and psychological aspects of the region (city, enterprise etc.) life. But it is not a simple task to convince such a manager of the high priority of the (re)training innovations, in comparison with other serious problems faced by an enterprise. One might add also that there are the same difficulties of understanding and acceptance caused by technocratic attitudes, as was true our experience (Podolski, 1993). The most direct way to solve these problem is provided co-ordinated training for both high-level managers and trainers. In this training, the training content and procedures are presented from a general and comprehensive standpoint. To do this there must be specially designed and co-ordinated curricula and training strategies. Some limited experience in this type of co-ordination was gained through a collaboration of scholars of Moscow State and Twente Universities together with practitioners from the Moscow and Kaluga regional employment services (Russia). The procedures, insights and results achieved give hope but further research is needed.

CONCLUSION

Recent developments have changed the state of art of the Instructional Design movement, and the changes seem to be of a general nature. A fundamental reorientation from the behaviourist to the cognitive paradigm emphasizes the active, constructive and contextualized character of the learning processes. Meanwhile, the unresolved contradiction still exists between, on the one hand, the prescriptive nature of the instructional design products, and, on the other hand, the current emphases on activity, constructive learning, goal-directness, and other aspects of learning which resist being prescribed (in the proper sense of the word). It seems to be highly doubtful, both practically and theoretically, that we can prescribe that the teacher does anything. What ID can and must prescribe are the definite directions, marks and "mile-stones" for the teacher (the designer) to use in thinking about instruction. The most important thing the modern ID might give a teacher is a general intellectual tool. This tool would not be used to prescribe the designer's or teacher's executive activity but rather to offer them an extended and sophisticated approach to the processes and events which constitute student learning and a teacher's instructional activity. Designers and teachers have to be provided with knowledge about the psychological mechanisms which underlie learning/teaching processes. They also need knowledge of how to "switch on" these mechanisms by means of creating and using a system of necessary and sufficient conditions.

A possible approach to constructing and using the appropriate "general intellectual tool", based on the Galperin's psychological doctrine, and especially on his "planned stage-by-stage formation of mental actions" theory, has been described. This approach gives a general outlook on different processes which underlie the acquisition of mental actions and concepts. It is based, on one hand, on a theoretical analysis of the nature of human mental life, and, on the other hand, on a carefully elaborated and tested system of psychological conditions of planned formation of mental actions and concepts. This system is sensitive not only to the functional and structural characteristics of schooling and instructional processes and products, but also to the age-related, and functional developmental variables. Once experienced in the use of this system, one may describe, in fact, the acquisition of any newly-formed mental structure in the specific and operationalized terms. The system is supplemented by a three-model scheme, which bridges the gap between the psychological conditions and a variety of real schooling (training) circumstances. Thus, this system gives a designer, as well as a teacher, a chance to predict the most probable developments, both in the realization of the definite teaching/learning process and in the characteristics of the products of this process.

High public expectations concerning the practical applications of theories and models elaborated in the realm of instructional design, have still not been satisfactorily met. The reason for this failure to meet expectations most probably is related to the gap between heterogeneous and multilevel, complex social realities in which learning processes occur and the relative homogeneous and single-level structure of current ID models and descriptions. The **Int**egrated **In**structional **De**sign **T**echnology (**INTINDET**) approach is considered to be an adequate framework for efforts toward closing this gap. The role of a general intellectual procedure to create the psychological knowledge base for such an approach is discussed. An example of an approach in which the requirements for an INTINDET intellectual tool are met (i.e., one which is sufficiently complete, sophisticated, and operationalized in terms of the approach promoted by Galperin, and revised and developed later by his followers) is discussed. This example of the INTINDET approach is the case of the retraining of highly educated unemployed persons in Obninsk city, Russia. The advantages, constraints and difficulties of real practical application of the approach are analyzed.

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Some Characteristics of Education in Finland and in the Czech Republic: A Comparative View

Jan Prucha

1. INTRODUCTION

During the last several years it has appeared a growing interest in evaluating the quality of education in various respects (economic, social, educational and other). A great effort has been directed towards measuring some characteristics of classroom learning environment or the quality of the school life. A number of empirical studies has been published (Fraser, 1986; Fraser and Walberg, 1991, and other) trying to prove that the quality of learning environment influences significantly the learning outcomes.

As argued by Fraser (1986), *„classroom environment is such a potent determinant of student outcomes that it should not be ignored by those wishing to improve the effectiveness of schools“* (p. 1). There is a number of empirical studies describing characteristics of learning environment in schools in a particular country but almost no studies of comparative, cross-national character.

At the same time, another great endeavour has been focused on developing ***international indicators of education***. The indicators are systems of statistical characteristics which are constructed in a way as to enable comparisons between two or more countries. According to West et al. (1995) the development of educational indicators is linked *„with a growing interest in monitoring and evaluating educational systems and a recognition of the potential benefits to be derived from cross-national comparative studies“* (p. 3).

In other words, evaluation of the functioning and quality of educational systems has accepted a comparative dimension. Not only characteristics of education in a particular country but characteristics of education in a broader international perspective have become, at present, a source of information about the functioning of educational systems demanded by economists, politicians, school policy-makers, education managers, and other. This is clearly apparent from activities developed by OECD, EU and other organizations aiming at the construction of educational indicators that can be measured as quantitative variables.

Among the recently published indicator sets the following ones are of primary importance:

- *World Education Indicators* (published in *World Education Report*, 1991), prepared by UNESCO. It covers more than 160 countries and includes quantitative characteristics of their population and educational systems such as enrolment ratios, duration of compulsory education, pupil/teacher ratio, public expenditure on education, and other. However, because it reflects the state of education in 80's this set of indicators cannot be used for comparative evaluation of the quality of education at the present time.

- Indicators of Education in OECD countries have been published in three volumes of *Education at a Glance* (1991, 1993, 1995). In its latest volume Education at a Glance (1995) contains a set of data covering also contexts of education (social, demographic, economic context), expenditures on education, results of education, and other. Among several new features of this set of indicators there are data providing the basis for a better understanding of the relationship between education and nón-educational variables , e.g. public confidence in the schools, unemployment and education, educational research and development personnel, and other.

- *Key Data on Education in the European Union* (1995) is another system of educational indicators which presents detailed statistical information about all levels of schools in EU countries (not including Finland, Sweden and Austria because the data reflect the situation around the years 1991/92 mostly). Special attention is given to curricular indicators in the respective countries (data on compulsory subjects, annual class hours, etc.) and, in its second part, to learning and teaching foreign languages during primary and secondary education, and other.

As a whole, the sets of data just mentioned create an information base for a newly emerging field that can be called ***comparative educational evaluation***. This is an analytical evaluation of various quantitative characteristics reflecting the functioning, productivity and other parameters of educational systems in different countries.The purpose of this new research field is both practical and scientific:

Practical purpose is, first of all, to provide „educational policy-makers with a richer array of international data than has ever been available before" (Education at a Glance: OECD Indicators, p. 7). Comparative evaluation thus satisfies a need for respecting global influences in which „educational performance has to be considered at a level beyond the traditional national context" (Education at a Glance: OECD Indicators, 1995, p. 7).

Scientific purpose of comparative evaluation is now clearly illustrated by some research projects. Among them the OECD project on *International Indicators of Education Systems (INES)* combines conceptual and methodological work in different domains of comparative evaluation as it is documented in the newest publications: *Measuring What Students Learn* (1995), *Measuring the Quality of Schools* (1995), *Public Expectations of the Final Stage of Compulsory Education* (1995).

Without any doubt the above mentioned activities are necessary and useful. In many countries evaluation of the quality of education has been identified with measuring achievements (learning outcomes) in various school subjects or curricular domains. However, the concept *quality of education* includes something more than just learning outcomes. Quality must be explained also from variables of the process and context of education. A number of models and/or measurements has been developed that can serve as a basis for evaluating the quality of education in its broader sense. Among them, e.g., the well known scheme „context - process - product" (Dunkin and Biddle, 1974) or Windham´s model of the educational production (Windham, 1988) are at disposal.

Also, in recent IEA evaluations there is a growing interest in measuring some determinants of achievement as, e.g., characteristics of intended curriculum, implemented curriculum and attained curriculum (Keeves, 1995). This contributes to a better understanding of the quality of educational process, too.

In the present paper we are comparing some characteristics of education in Finland and in the Czech Republic utilizing data published in IEA studies on reading literacy.

2. SOURCES OF DATA: FINNISH AND CZECH IEA STUDY

In the school year 1990/91 an IEA research project called *Reading Literacy Study (RLS)* has been accomplished in 32 countries, among them in Finland. In each country, the RLS covered two age groups: population (A), 9-year-old students, and population (B), 14 -year-old students.The study has been focused on reading performance applying tests for measurement of text comprehension and skills in different literacy domains. The samples and data in international perspective have been described by Beaton (1994) and Elley (1994).

It is a well known fact that in the international comparison Finnish students obtained the highest average scores of reading achievement at both 9 and 14 year olds. This result has been already discussed and explained by Linnakylä (1993) in an article called „*Exploring the Secret of Finnish Reading Literacy Achievement*". Among her explanations the most decisive are social, cultural, and pedagogical facilitating factors. For example, as already stated by Elley (1992), literacy is highly evaluated in Finnish society and, therefore, Finnish schools exert high expectations on reading proficiency.

This is supported also by findings of a longitudinal study on the development of reading skills in the Finnish comprehensive school (Julkunen, 1994). The findings indicate that „Finnish students´ literacy develops quite well in the course of the comprehensive school. They learn to read factual texts, in particular, already in the lower stage. At the end of the ninth grade, the students´ performance in factual texts is at least satisfactory" (Julkunen, 1994, p. 67).

There is, however, a high degree of interdependency and mutual influence among the factors of different nature that facilitate high scores of reading performance of Finnish youngsters. As Lynnakylä (1993) described it was found that Finnish students´ self-assessment of their own reading ability was low (only some 10% of students in both age groups rated themselves as „very good readers") - which is in contradiction to the highest scores in reading performance. It was assumed that discrepancy between achievement and self-perception may reflect „cultural norms of modesty" in Finnish society. In general, all this indicates that an adequate explanation of the quality of education is extremely complicated and still unclear in some aspects.

The Czech situation in this field is quite different from the Finnish one. Till the year 1990 the former Czechoslovakia did not participate in IEA comparisons or any other assessment of educational achievements on international level that were initiated by Western European researchers. The former ideological rulers of education in Czechoslovakia refused to compare through objective procedures the results of the „socialist school" with the outcomes of schools in the capitalist societies. Only after the „velvet revolution", in November 1989, many substantial changes have been realized in education (see, in more detail, Prucha, 1991 a, 1992)) and Czechs began to cooperate in international projects (PHARE, and other). First of all, in 1991 Czech educational researchers started to participate in IEA studies, i.e. in TIMMS (The Third International Mathematics and Science Study).

In the framework of IEA Czech Republic realized also the Reading Literacy Study, in April 1995. It was a replication of the RLS applying the same methods and procedures with comparable samples of subjects, schools, etc. as used in Finland and other countries in 1991. Consequently, Czech data are fully comparable with data of other countries though there is a time distance of four years between them. One can admit, however, that during this short period the characteristics of reading literacy did not change substantially in any country.

Czech findings on reading literacy have been published by Straková and Tomášek (1995). Czech samples included 2719 students of population (A) and 2801 students of population (B), i.e. representing grade 3 and grade 8 of the basic school (compulsory education starts at the age of 6 years in the Czech Republic). The classes were selected, in accordance with the IEA technical procedures, from ordinary schools (N = 130) located in different territories of the country.

As it was done in Finland and elsewhere the Czech study includes not only scores in reading tests but also findings from questionnaries administered to students and from other questionnaries responded by teachers and by school principals. The items of students´ questionnaries reflect various aspects of the „quality of school life“ and reading instruction. Finnish findings have been already discussed and compared with Nordic, German and American findings, by Linnakylä (1995).

In the following section we compare Czech and Finnish data, with respect of two topics:

- First, a simple comparison of Czech and Finnish scores in reading lieracy will be presented. As a matter of fact, Czech findings of RLS have been published in Czech only and, thus, our comparison is the first presentation of them in English to international audience.
- Second, we will compare the findings concerning the quality of life in Finnish and Czech schools as perceived by students.

3. FINNISH AND CZECH READING LITERACY ACHIEVEMENT

Reading literacy achievement was assessed by means of tests measuring the level of performance in several kinds of operations with three types of texts (narrative texts, expository tests, documents). Detailed results have been presented in above mentioned sources. In Table 1 we compare the average scores for all text domains.

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Table 1

Reading Literacy Scores

	Population A	Population B
Finland	569 (average age: 9.7)	560 (average age: 14.7)
Czech Republic	505 (average age: 9.3)	520 (average age: 14.3)

The differences between Finnish and Czech scores are apparent at first view: Whereas Finnish students attained the highest level at both age groups and, thus, ranked on the first place among other countries Czech students ranked on the 14th place at population A (among 29 countries) and on the 17th place (among 32 countries) at population B.

Czech scores are not bad at all: At population A they are better than, e.g., in Canada, The Netherlands or Danemark, at population B they are better than , e.g., in Norway, Italy or Belgium. Anyway, there is a difference between Finnish and Czech scores which is bigger at population A (difference D = 64 Rasch scores) than at population B (D = 40 scores).

What can be causes of differences between Finnish and Czech results?

As for Finnish scores the explanations for the highest reading achievement have been already published by Elley (1992), Lynnakylä (1993) and Julkunen (1994). The explanations can be summarized as follows:

- *linguistic* reasons: an unusually regular orthography of the Finnish language; the Finnish speaking schools are homegenous linguistically
- *cultural* reasons: reading literacy is highly valued in Finnish society; easy access to books and newspapers through the extensive network of public libraries
- *pedagogical* reasons: reading instruction in Finland emphasizes a student-centred and strategy-oriented approach; high demands and expectations of teachers, and other.

As for Czech scores and their lower values we tried to identify the following causes (utilizing data published by Straková and Tomášek, 1995):

(1) Czech pupils are slow in handling written tests

Unlike in Finland and other Western European countries pupils in Czech Republic are not accustomed to work with written tests demanding certain performance in limited time. This is a heritage of the socialist regime (1948-1989) in which use of tests was expelled from schools as something which comes from „bourgeois" education and makes undesirable selection among children. Even nowadays when such restrictions do not exist the most frequent method of assessment in Czech classrooms is oral questions and written tests are used by teachers very seldom.

As a consequence, Czech pupils in comprehensive schools are not familiar with fulfiling different kinds of tests and they are too slow in copying with solving test tasks. Therefore, a great part of pupils involved in RLS was not able to accomplish tests as a whole in a prescribed time: 55% of pupils in population A and 44% of pupils in population B. This has affected negatively the total average scores of Czech students.

(2) Differences between urban and village schools

As for results in RLS there are differences between Finnish and the Czech subjects caused by schools located in urban vs. village environments.

- In Finland (as in Sweden, Norway, Island and several other countries) no significant differences in reading achievement between urban and village schools have been found. In this respect the quality of production of Finnish comprehensive schools is rather homogenous across different regions of the country.

- On the contrary, in the Czech Republic (as in a prevailing number of countries participating in RLS) *pupils of schools located in big cities have obtained better scores than pupils of village schools (or schools located in small towns*). The differences in scores have been found both with population A and with population B. Table 2 presents some data of the differences.

As apparent in Table 2 average RLS scores are in clear correspondence with the size of community in which a school is located: Pupils attending schools in villages or small towns (locality 1) have lower reading scores, in both age groups, than pupils attending schools in big towns and the Prague city.

This type of differences in the Czech Republic has been evidenced also by other empirical studies. In his book on „Educational Evaluation" Prucha (1996) compared the findings of several Czech studies that came independently to a conclusion about better achievements of pupils in big cities than in village schools. For example, an assessment of comprehensive schools called Kalibro (1995) tested around 13,000 pupils of Grade 8 (14-year-olds, i.e. as in population B of RLS). In four curricular domains (language, mathematics, social sciences, sciences) the results reflecting pupils´ knowledge and skills were somewhat lower in village schools. The most significant differences have been found in tasks covering language (mother tongue): The average percentage of correct responses of students was 49.5% in village schools whereas in urban schools (big cities) it was 56.0%.

Table 2

Average RLS scores in Czech schools of different localities

	locality (1)	locality (2)	locality (3)	locality (4)
population A	487	512	522	549
population B	512	521	521	562

locality (1): up to 10,000 inhabitants, (2): up to 100,000 inhabitants,
(3): up to 1 million inhabitants, (4) over 1 million inhabitants (Prague city)

Also several other empirical studies performed in 80´s bring evidences about this kind of differences. Because there are no explanations about the causes of the differences we can only hypothetically suppose that

- generally, comprehensive schools in Finland are rather homogenous as for the quality of teaching, high status of teachers, level of technical equipment, and other. This homogenity then leads to non-significant differences in reading performance of students attending schools in various regions.

- Czech comprehensive schools are more differentiated as for the quality of their outputs depending on the type of locality. However, the differences between schools of different regions (urban vs. village schools, in particular) are caused not so much by inner attributes of schools and character of teaching but probably more by external factors. Among them, sociocultural and socioeconomic characteristics of families in urban and village areas might be most influential. As evidenced by demographic surveys, the social status, income, and educational level of parents in urban families and, especially in Prague city, is higher than in families living in villages or rural areas. Also, their cultural patterns are dissimilar and, as a whole, this contributes to differences in reading achievements.

As an example we can utilize here our empirical study (Prucha, 1992 b) dealing with the analysis of pupils´ knowledge about The Netherlands (this topic was used for comparing „intended curriculum" vs. „attained curriculum"). The sample (N = 208 pupils) covered schools from contrastive regions: three schools from Prague city and two schools from rural area of South Bohemia. The study revealed non-significant differences between boys and girls in pupils' knowledge and attitudes but significant differences depending on region: pupils from village schools achieved lower percentage of correct conceptual knowledge than pupils from urban schools. When inspecting the causes of the differences we have found that they were mainly connected with dissimilar sociocultural background:

- First of all, the educational level of families in Prague sample was much higher than of families in rural sample: 46% of pupils in Prague sample had parents (fathers, mothers, or both) with completed higher education whereas in rural sample there were only 3.8% of such parents

- Another cause seemd to be different pattern of exposition to mass media and different structure of information sources: Pupils from village schools devoted less time to watching television, reading newspapers, visiting cinema and theatre than pupils in Prague city. Also, parents in village area helped less their children with their preparation for school demands than parents in urban area.

As a whole, it can be stated that Czech pupils in village schools might be disadvantaged (if compared with their urban classmates) as for worse chances to utilize sources that could increase their formal knowledge expected by school. And this might contribute also to lower reading scores of children from village schools.

It must be emphasized, however, that this difference among schools of different regions is existing on the level of comprehensive schools but not as for secondary schools attended after compulsory education. In a recent comparative evaluation of Czech gymnasiums (i.e. a type of upper secondary school leading to higher education) it was found that among the schools with the best achievements there were schools of small towns and provincial areas as well as of big towns and the Prague city.

(3) Different reading habits of Finnish and Czech pupils

There are several reasons for lower scores of Czech pupils in RLS stemming from their reading habits that are dissimilar with Finnish population. Some data are presented in Table 3.

The data have been calculated from questionnaries in which pupils rated how often during a week they read different kinds of printed texts. It is apparent that Finnish pupils read more frequently periodicals, especially newspaper,

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which makes also higher total frequency of reading in Finnish youngsters than in Czech youngsters. Similar relations concerning reading periodicals have been found in population A.

Table 3

Average frequency of reading printed texts (population B)

	books	journals	newspaper	total
Finland	6.31	13.45	18.12	37.88
Czech Republic	7.79	10.45	8.72	27.00

Different reading habits of Czech and Finnish youngsters are probably connected with an access to books, journals and newspaper in their families. Through the RLS questionnaire pupils were asked to evaluate how many books they have in their homes and if their families regularly buy some newspaper. The data comparing Finland and the Czech Republic (population A) show that as for number of books in family Finnish and Czech sample does not differ much. However, as for access to newspaper Finnish children have much better chances to everyday reading of some newspaper than Czech children (see Table 4).

It is problematic, of course, how much reliable is the estimate of number of books by 9-year-old children. But as for access to newspaper the data are in strong correspondence with frequencies of reading newspaper (cf. Table 3). Thus, a better access of Finish children to newspaper in families might contribute to better scores in RLS, too.

Table 4

Access to books and newspaper in Czech and Finnish families

	average number of books in family	proportion of families buying newspaper every day
Finland	135	92%
Czech Republic	121	44%

(4) Reading vs. watching television

One of the most important factors influencing reading habits and reading achievement of young people is the time devoted to watching television. In this respect Finnish and Czech pupils differ again. In Table 5 there are data of the questionnaire in which the pupils were asked to estimate how much time they watch television every day (in weekdays).

Table 5

Watching TV by Finnish and Czech youngsters

	population A		population B	
	average number of hours a day	more than 5 hours a day	average number of hours a day	more than 5 hours a day
Finland	2.4	6.1%	2.3	2.9
Czech Republic	2.5	11.6%	2.6	6.2%

As seen in Table 5 an average amount of time spent by watching television is almost the same in Finnish and Czech populations. However, the number of pupils who spend more than 5 hours a day by watching television is ennormously higher in Czech population A and B than in Finnish ones. This fact has some negative consequences for reading achievement:

By special statistical analysis it has been proved that there is a correlation (in Czech population A and B) between the amount of time devoted to watching television and reading scores: The poorest reading scores have been attained by those pupils who spend a highest amount of time (more than 5 hours daily) by watching television. And because the number of such pupils in Czech samples is much higher than in Finnish samples (as seen in Table 5) this can be taken as one of the explanations of the total worse reading achievement of Czech pupils compared with Finnish pupils.

(5) Television programmes with and without subtitles

There is also another difference between Finland and the Czech Republic linked with watching television: As mentioned by Lynnakylä (1993) Finnish children are exposed to many foreign TV programmes with subtitles which they have to read fairly fast if they want to follow them. She quotes some empirical studies suggesting that this activity motivates and enhances reading performance in children.

On the contrary, Czech children are also exposed to many foreign TV programmes (mainly American and British) but subtitles are presented very seldom with them. In Czech televison as well as in foreign films presented in cinema there is a tradition of dubbing and, at present, this is realized in almost all foreign programmes aimed at young audience. Though the quality of Czech dubbing is very high (because many of the best actors are specialized in it) the replacement of foreign speech has negative impacts, too. Not only it does not enhance reading development (as it is the case in Finland, Norway and elsewhere) but it also does not supporte learning foreign language (mostly English) through TV programmes.

(6) Learning environment in Finnish and Czech schools

In the project of RLS teachers of all participating countries completed a special questionnaire including also questions about their opinions and beliefs on reading instruction. If one compares opinions of Finnish and Czech teachers there are only slight differences in this respect. For example, Finnish teachers emphasize a student-centred and strategy-oriented approach in reading instruction. When evaluating instructional aims Finnish teachers valued more development of pupils′ interests than Czech teachers who emphasized both development of pupils′ interests and development of reading skills (in population A).

However, the most important difference in teachers′ behaviour is linked with another matter: The difference is probably in the character of learning environment created by Finnish and Czech teachers in their classrooms. Here, unfortunately, there is a lack of empirical data which would enable a comparison of learning environment in schools of both countries. For example, Olkinuora and Lappalainen (1991) developed an instrument called *Classroom Learning Environment Questionnaire* (*CLEQ*) which is applicable for students self-evaluation of their classroom environment. A similar instrument called *My Class Inventory (MCI)* was applied by Czech researchers. Though the instruments are not fully comparable they indicate possibilities of comparative analysis of learning environment in Finnish and Czech schools.

Coming from experiences gained by visiting a number of schools in Finland and in the Czech Republic we can at least hypothetically assume: A general style of teaching or „teaching culture“ in Finland is more „pupil-friendly“, less authoritarian, less content-centred, more respecting individuals than in Czech comprehensive schools. Certainly, during last several years education in Czech schools has changed in some respects due to renewing democracy in the country. But there is no research about how teaching in schools looks like nowadays. The last analyses of classroom learning and teaching were carried out in the late 80´s (see, e.g., in Prucha, 1991) and, at present, nobody has published new data about the character of educational process in contemporary Czech schools.

Indirect evidences about the character of school life in Finland and in the Czech Republic can be drawn from data published in the framework of RLS by Lynnakylä (1995) and Straková and Tomášek (1995). We will deal with them shortly in the following section.

4. QUALITY OF SCHOOL LIFE AS PERCEIVED BY FINNISH AND CZECH PUPILS

In her paper Linnakylä (1995) compared the quality of school life in Finnish comprehensive schools with Nordic, German and American schools. She defined *quality of school life* as „students´ general well-being and satisfaction, and from the point of view of their positive and negative experiences, particularly in activities typical of school“ (Linnakylä, 1995, p. 2). As an empirical data-base she utilized data from the questionnaire that was applied as an self-assessment instrument for students participating in RLS. Students responded to 29 items representing 6 domains of school life. Each domain was operationalized in several items, e.g. *School is a place where ... I feel happy* (an item expressing general satisfaction).

In Czech samples Straková and Tomášek (1995) applied the same questionnaire and published the data. This makes possible to compare Finnish and Czech findings.

As a whole, perception of school life by Finnish pupils and Czech pupils reveals some similarities as well as some discrepancies. This can be seen in Table 6 (presenting only examples, not all items).

It can easily be seen that the experiences of Finnish and Czech students (14-year-old) from their learning environments are different in some dimensions. In particular,

- Czech students are more satisfied with their teachers and feel happier than Finnish students

- on the contrary, Finnish students seem to have much higher status in their classes than Czech students.

Table 6

Students' assessment of school life

items of the questionnaire	% of students who agree Finnish	 Czech
General satisfaction		
I really like to go to school	49	38
I get satisfaction from the school work I do	14	59
Teacher-student relations		
Teachers treat me fairly in class	56	82
Teachers help me to do my best	43	76
Status in class		
People look up to me	50	13
I feel important	54	21
People come to me for help	69	31
Social identity		
Mixing with others helps me to understand myself	81	74
I have learned to accept other people as they are	90	95
Achievement and opportunity		
I know I can reach a satisfactory standard	77	90
I know how to cope with the work	92	93
Negative affect		
I feel depressed	24	11
I feel happy	21	48

Low social status reflected by Czech students might be connected with what was mentioned above about the (probably) authoritarian style of education in Czech schools. If Czech pupils are convinced that they do not „feel important" (only 21% of them feel important compared with 54% of Finnish students) or if only 13% of Czechs express that „people look up to me" (compared with 50% of Finns) then this may reflect a low self-esteem of Czech youngsters.

Generally speaking, this kind of comparison reveals some similarities as well as differences in characteristics of the school life in particular countries. Some of the differences stem from specific features of Finnish education that are even not typical of other Nordic countries. As Lynnakylä (1995) stated,

„the Finnish comprehensive school has done rather well in achieving good academic learning standards... Our school seem to be demanding but depressing learning environment" (p. 15).

On the other hand, Finnish students resembled Americans in assessing their status in class most positively and, the same, in the domain of achievement and opportunity.

A similar statement can be inferred about Czech students. Though a teacher-centredness and content-centredness are still strong in Czech schools (and, thus, similarly to German schools) Czech students are more satisfied with how teachers help them than perhaps Finnish students feel. What seems interesting here is that in their historical development both Finnish and Czech educational thinking have been much influenced by German didactics (as for Finnish education see Kansanen, 1992). This probably led to a strong emphasiz of the role of curriculum and normative principles in educational systems of both countries.

5. CONCLUSIONS

As for assessment of the quality of school life the above mentioned comparison of Finnish and Czech situation must be understood with some caution. Though the comparison is based on data of IEA study (which is, certainly, quite exact in other respects) there can be some doubts as for findings gained by means of questionnaire. As with all questionnaries there is a question of the reliability of the responses. How far can we assume that the responses elicited by students - when they assess, e.g., their relations to teachers - are perfectly true? Always, one must assume certain biases in data received by means of written questionnaries, especially when they are administered to children.

Some biases can be caused by cultural patterns in a particular country. For example, in Finnish population (A and B) there was a discrepancy between highest reading achievement, on the one hand, and low self-perception of their reading ability as 'very good'. In fact this self-rating of Finns was the lowest among other Nordic countries: 10.2% of Finnish students were convinced (in population A) that they are very good readers compared with 26.8% of such students in Danemark (though Danes scored 475 in RLS vs. 569 scores of Finns). This phenomenon can be explained by „cultural norms of modesty" (Lynnakylä, 1993) that are still rooted in Finnish society. Similar examples can be introduced as for Czech students and their assessment of the quality of school life.

A need for comparative cross-national studies on educational processes

As mentioned above there is an increasing need for developing instruments that could evaluate various features of educational achievement in different countries. The same is true of evaluating the characteristics of educational processes. Comparative educational research has, at present, at disposal a lot of data concerning school systems in European and other countries (e.g., Key Data on Education in the European Union, 1995, and other). Also, there are studies describing learning environment in classrooms as perceived by students in some countries (Fraser and Walberg, 1991, and other).

However, there are no findings comparing directly an actual process of learning and teaching in classrooms, in their natural setting and conditions in which they are performed, based on objective observation. This is also mentioned by Kansanen (1995): *„An interesting research question is how similar or how different the real teaching process is in various countries with different curricula"* (p. 159). Postlethwaite (1995), too, is of the opinion that IEA study and similar constitute *one* of many approaches in the realm of comparative education.

. Of course, comparative cross-national study of real educational processes is a very difficult and costing matter. But it should be done as the next and certainly useful step in discovering the „secret of education" from the point of view of comparative evaluation research.

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Den inlärningspsykologiska grunden för didaktik

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Inledning

Det är svårt att definiera undervisning. Det är dock oftast möjligt att enas om att undervisning alltid handlar om att någon undervisar någon om något. En sådan definition inkluderar på sätt och vis även det speciella fall då den som undervisar är samma person som blir undervisad. Exempelvis kan vi tänka oss en situation där en liten pojke försöker lära sig cykla. Han gör försök efter försök men ramlar ständigt omkull med cykeln. Men varje nytt försök ger honom ett tillskott i form av kunskap om hur han och cykeln fungerar ihop och detta leder till slut till att han lärt sig cykla.

Det är med avsikt jag har valt att illustrera lärare-elev relationen ovan med hjälp av en situation som skulle kunna sägas handla om motorisk inlärning. Kunskapen att cykla och processen att nå sådan kunskap avviker tydligt från vad vi normalt tänker oss gälla för undervisning i ett skolsammanhang och som kan gälla som ram för en diskussion om undervisningkonst och pedagogik. I litteraturen inom området didaktik diskuteras didaktiska frågeställningar som har generell giltighet för undervisning och pedagogik. Men som jag ser det, är detta en konsekvens av att sakförhållandena inte tillräckligt har analyserats. Om så vore fallet skulle det ha varit tydligt att det inte är möjligt att göra generella uttlanden om undervisning, och då i betydelsen hur undervisning skall bedrivas, eftersom den situation som åsyftas inte har generell karaktär. I den bemärkelsen är illustrationen med pojken som försöker lära sig cykla ett gott exempel på en situation som måste hanteras på annat sätt än en situation som är annorlunda, t ex undervisning i matematik. Det är således uppenbart att det som skall läras in, kompetensens natur, är av betydelse för hur undervisning skall bedrivas. Vi kan t ex erinra oss Tulvings syn på minnet som episodiskt eller semantiskt (Tulving, 1962; Tulving, 1983) för att inse att det inte kan finnas några generall utsagor om hur elevernas inlärning, förståelse eller minnesbehållning skall påverkas. Olikheterna är alltför stora. Detta medför att avgränsningen i området ämnesdidaktik gentemot allmändidaktik blir utan innebörd. Det grundläggande problemet finns inte kopplat till ämnet eller om man så vill till undervisningens innehåll utan till elevens hantering av innehållet. En didaktisk teori måste därför, för att kunna säga något meningsfullt om hur undervisning skall bedrivas, grundas på elevens sätt att tänka. Det är således tämligen ointressant om undervisningen behandlar matematik, slöjd eller cykling eftersom det är individens sätt att uppfatta det som är undervisningens innehåll som är avgörande för hur undervisning skall bedrivas. Detta betyder att individnivån blir den kritiska nivån för all undervisningsverksamhet. Ingen undervisning kan riktas mot grupper eftersom det är individer som undervisas. Ingen grupp kan lära sig något eftersom det är individer som lär sig. Och ingen grupp kan utvecklas eftersom det är individer som utvecklas. Språkbruket bör mot den här bakgrunden skärpas och inte behandla undervisning och inlärning m m som om något annat än individnivån gäller, eftersom ett olämpligt val av terminologi riskerar att förvränga problemet och försvåra analysen av det.

Även om definitionen ovan inte är särskilt precis är den dock tillräckligt precis för att man skall kunna urskilja några grundläggande utgångspunkter för en mer detaljerad och fördjupad analys.

För vårt syfte är det framförallt innebörden av påståendet att undervisning handlar om att någon undervisar någon om något som är av betydelse, eftersom den mycket tydligt anger att det är individer som är engagerade i aktiviteten undervisning. I fortsättningen kommer undervisning främst att behandlas i en begränsad mening på så sätt att det handlar om en idealsituation i klassrumsmiljö. Mitt syfte är att presentera en teori, grundad på inlärningspykologi, som ger en fast utgångspunkt för didaktisk teori. Didaktik tänker jag mig som undervisningskonst i den mycket konkreta bemärkelsen att didaktisk kunskap skall kunna användas för att förbättra den undervisning som bedrivs i olika utbildningssammanhang.

Bestämning av didaktik

Under lång tid har inlärningspsykologi betraktats som mindre intressant för undervisningssektorn. Progressiva krafter har istället orienterat sig mot kontinentala strömningar av idéer där didaktik och didaktiskt tänkande har diskuterats. Särskild betydelse har ägnats den historiska dimensionen, där Ratke, Comenius m fl (Kansanen, 1993) har uppmärksammats. Wolfgang Ratke (1571-1635) anses av Kansanen (op.cit) vara upphovsmannen till begreppet "Didaktik", som definierades som "Lehrkunst". Comenius (1592-1670) (op.cit) använder begreppet didaktik på samma sätt som Ratke och definierade Didaktik som undervisningskonst (Lehrkunst).

I Norden har intresset för didaktik manifesterats genom att flera professurer med didaktisk inriktning har inrättas vid universiteten. Inlärningspsykologi, och då särskskilt behavioristisk inlärningsspsykologi, har emellertid kommit att få en mer undanskymd betydelse och kommit att anses som icke relevant då det gäller undervisningsforskning.

I några fall har man tagit stark ställning mot inlärningspsykologi och mot psykologiserande då man ansett att sådant tänkande är *malplacé* då det gäller t ex läraryrket och undervisning.

Personligen anser jag att en ensidig allmän betoning på didaktik eller didaktiskt teori, så som dessa begrepp ofta definieras, inte kan lämna några svar på frågor som har relevans vare sig för utövande av läraryrket eller då det gäller utbildning av lärare. Däremot är det möjligt att på basen av relevant psykologi kunna utveckla sådan kunskap som är av direkt teoretiskt och tillämpat intresse för undervisningssektorn och som kan ligga till grund för modern didaktisk teori eller didaktisk forskning. Det är därför av central betydelse att rensa bort kvasiintellektuell snårighet som produceras av verbala ekvilibrister under rubriken didaktik. I grunden ligger problemet i att inse att kunskap om undervisning endast kan erhållas genom empirisk forskning om undervisning som har ett individperspektiv på undervisning. Begreppsliga bestämningar av vad som är didaktik eller i vilka olika verbala former didaktik kan uppträda, kan aldrig öka vår kunskap om t ex vad som är god undervisning eller ge oss kunskap om undervisning, som skall kunna förmedlas till nya lärargenerationer. Inte heller tjänar det något till att definiera didaktik som Edholm och Kroksmark (1995) gör då de föreslår att didaktik definieras som

> vetenskap och lära om undervisning i alla dess möjliga innehåll och former (s 45).

En sådan definition gör begreppet allomfattande men tomt på på relevant innebörd för ett undervisningssammanhang. Det kan också vara av intresse att notera att den ursprungliga betydelsen, att se didaktik som undervisningskonst, har fallit bort. Istället är det ett metaperspektiv som framträder, genom att didaktik närmast blir läran om undervisning istället för läran om hur undervisning bör bedrivas.

Undervisning och inlärning

Inlärning kan definieras som att en persons kunskaper om något förändras. Förändringens natur behöver inte här närmare bestämmas. Det räcker för våra syften att acceptera att en persons kunskaper kan förändras genom inlärning.

Den främsta anledningen för all undervisning är därmed att utöva inverkan på en person så att dennes kunskaper förändras. Genom undervisning vill man t ex undvika att lämna den lärande helt på egen hand med sin inlärning för att på så sätt söka effektivisera personens inlärning i en viss riktning.

En viktig utgångspunkt är att undervisning alltid innebär att det finns ett normativt ställningstagande. All pedagogisk verksamhet är f ö att betrakta som normativ, då den alltid är relaterad till ett överordnat syfte eller intention med bestämt innehåll.

En annan viktigt antagande är att det inte finns något kausalsamband mellan undervisning och inlärning. Detta betyder att undervisning aldrig kan sägas orsaka inlärning hos eleverna. Hur väl genomförd en lektion än må vara så betyder detta inte att eleverna har lärt sig det läraren har avsett. Sambandet mellan undervisning och inlärning är av annat slag. I viss mening är det en fråga om en statistisk variabel, vilket i det här sammanhanget betyder att god undervisning ökar sannolikheten att eleverna lär sig undervisningsinnehållet.

Normativitet och det pedagogiska perspektivet

Truismen att läraren har en normativ relation till undervisningen, stoffet och elevens inlärning av stoffet har flera implikationer. Normativiteten är s a s inbyggd i undervisningen eftersom läraren har den yttersta, verkställande funktionen i ett system vars främsta uppgift är att uppfylla samhällets, eller någon annans, önskemål när det gäller målen med undervisningen. Ett sådant förhållningssätt till undervisning och till elevens inlärning leder till en omedelbar konflikt med lärarens möjligheter att se eleven i ett inlärningspsykologiskt sammanhang eller i ett kognitionspsykologiskt perspektiv (se Wenestam, 1993). Jag har i andra sammanhang valt att beskriva grunden för denna konflikt, d v s spänningen mellan lärarens relation till undervisningen och till elevens inlärning och tänkande, som ett uttryck för en konflikt mellan ett pedagogiskt perspektiv och ett kognitivt perspektiv. I korthet innebär denna konflikt att en person som intresserar sig för att undervisa en elev inte samtidigt kan tillåta sig att låta eleven utveckla sitt tänkande hur som helst. Det naturliga är att man i ett pedagogiskt perspektiv försöker styra elevens tänkande i en önskad riktning. Men sett ur ett kognitivt perspektiv är det elevens tankeformer i sig som är det intressanta och värdefulla. I det här perspektivet är det ointressant i vilken mening eleven har lärt sig eller förstått något på ett avsett sätt.

Ett pedagogiskt perspektiv är alltid normativt. Läraren har därför alltid med nödvändighet en normativ relation till sin uppgift. All undervisning har, vilket nämndes ovan, till syfte att undervisa någon om något. Detta något är alltid i någon mening definierat i förväg. I en undervisningssituation, där det finns en lärare och en eller flera elever är ett undervisningsinnehåll alltid underförstått och behöver inte pekas ut. Det finns också en uttalad förhoppning att eleven lär sig det läraren, genom sin undervisning, försöker lära denne. I en undervisningssituation uppträder läraren inte på ett godtyckligt sätt. Inte heller kommunicerar läraren med eleverna på ett godtyckligt sätt. Inte heller är innehållet som lärarens undervisning behandlar godtyckligt valt och slutligen, vad som är att betrakta som en god eller dålig studieprestation är inte godtyckligt.

Intentionalitet

I varje undervisningssituation finns någon som skall undervisa någon om något. Den minsta konfigurationen är således en lärare, ett undervisningsinnehåll och en elev. Vi har svårt att tänka oss att någon av de här komponenterna inte går att identifiera i en undervisningssituation. Naturligtvis kan vi tänka oss olika varianter av den ovan beskrivna konfigurationen men detta är inte nödvändigt att diskutera i det här sammanhanget då det inte har någon betydelse för det förda resonemanget.

Intentionalitet är grundläggande för mänsklig kognition på så sätt att den alltid uppvisar en riktning och därmed är uttryck för en avsikt och är en viljeyttring. I det här sammanhanget är intentionaliteten av betydelse för att vi måste anta att vare sig läraren eller eleven är inställda på att den andre är omöjlig att förstå eller att undervisningens innehåll är slumpmässigt och läraren godtycklig i sitt agerande.

Istället är det rimligt att anta det motsatta. Både läraren och eleven kan antas ta för givet att den andres agerande och tänkande har innebörd, d v s är meningsfullt och kan förstås.

Detta betyder att det en lärare gör i ett klassrum då han/hon undervisar inte kan beskrivas som slumpmässigt, godtyckligt eller utan innebörd. Inte heller är det rimligt att beskriva en elevs agerande och tänkande som slumpmässigt, godtyckligt eller utan innebörd.

I en undervisningssituation har både läraren och eleven intentioner som är förknippade med personernas närvaro och med respektive ageranden. I en ideal undervisningssituation har läraren intentionen att undervisa eleven så att denne lär sig det undervisningsinnehåll som behandlas. Eleven å sin sida har intentionen att lära sig det läraren vill att han/hon skall lära sig. Det verkar således inte finnas någon intressekonflikt eller något hinder för att bådas intentioner skall kunna uppfyllas.

Men denna konsensus är skenbar. Det finns grundläggande svårigheter att samtidigt kunna uppfylla lärarens och elevens intentioner. En anledning är att lärarens intentioner grundar sig på ett normativt förhållningssätt till undervisningen, stoffet och elevens inlärning medan elevens intentioner grundar sig på ett relativt förhållningssätt till lärarens undervisning och det undervisade stoffet. Vad gäller lärarens intentioner har jag ovan påpekat att all undervisning med nödvändighet är normativ eftersom undervisning innebär en verkställighet av intentioner.

Vad gäller elevens eller elevernas intentioner och deras relativa förhållningssätt till det som skall läras in eller förstås är detta en följd av flera omständigheter. För det första har inte eleven à priori kunskap om vad som skall läras in. Eleverna ingår i undervisningssituationen men den är inte ett uttryck för elevernas intentioner utan baseras på andra utgångspunkter, t ex skolplikt. Väljer man att att se saken ur ett undervisningsinnehållsligt perspektiv kan man tillägga att eleven inte besitter kunskap om det "rätta svaret", d v s eleven vet inte i förväg hur den kunskap är beskaffad som anses representera legitim eller korrekt kunskap och kan inte, som läraren, ge omdömet "inlärt" eller "förstått". Om det vore på det sättet vore undervisningen onödig.

I det här perspektivet förefaller det resonemang Bengtsson och Kroksmark (Bengtsson & Kroksmark, 1994) har, som besynnerligt, eftersom de föreslår en minskning av betydelsen av lärarens kunskaper om undervisningsinnehållet men en betoning av lärarens kunskaper om metodik och elevens sätt att uppfatta undervisningsstoffet. De skriver:

> Det går också att hävda, att det inte är ämneskunskaper som är avgörande för lärarkompetensen, utan kunskaper om hur den lärande förstår, definierar, uppfattar, etc. kunskaper som är mest betydelsefulla. Om det är en färdighet som skall läras är förhållandet något annorlunda. Här tycks inte färdigheten i sig vara nödvändig att besitta för den som skall lära ut, utan ett specifikt förhållande till denna. Det verkar emellertid vara så att det är viktigt för en lärare att också i detta fall vara väl förtrogen med hur den lärande uppfattar färdighetens innehåll. Av mer grundläggande karaktär är dock den rent metodiska kompetensen för lärare, d v s. den kompetens som avgränsar undervisning uttryckt i termer av att på ett kompetent och säkert sätt lära någon annan att lära sig. Därmed inte sagt att andra komponenter är oväsentliga, utan endast att den metodiska kompetensen tycks vara överordnad de andra, om vi

talar i termer av lärares undervisningskompetens. Ference Marton har framkastat att det är didaktiken och inte ämneskunskaperna som utgör den lärarunika kunskapen (Bengtsson & Kroksmark, 1994, s 59)

Avsnittet ovan inbjuder till kritiska anmärkningar. En sådan kritisk punkt gäller definitionen av didaktik. Det är ett välkänt faktum att det inte finns någon etablerad defintion av didaktik (se t ex Kansanen, 1993), vilket gör uttalandet om de lärarunika kunskaperna tveksamt. Men framför allt innebär det resonemang Bengtsson och Kroksmark för, att de inte tänker på att undervisningen inklusive dess innehåll representerar ett normativt ställningstagande. Enklast framstår problemet om vi funderar på om undervisning kan handla om vad som helst och att alla undervisningseffekter är lika bra. Vi inser omedelbart att undervisning inte kan bygga på att ett godtyckligt undervisningsinnehåll även om undervisningen i sig kan betecknas som god. All undervisning är uttryck för intentioner, d v s all undervisning syftar till kunskaper hos någon. Intentionerna med undervisningen är alltid riktade mot något mål eller uppfyller i förväg definierade förväntningar eller krav. På så sätt är det av utomordentlig betydelse att lärarens ämneskunskaper är välutvecklade. Det kan inte vara rimligt att lyfta fram lärarens metodiska kunskaper om inte ämneskompetensen kan tas för given. Jag vill därför hävda att goda kunskaper i ämnet (undervisningsstoffet) är en förutsättning för god undervisning. Detta gäller oavsett det är fråga om teoretiska kunskaper eller om färdigheter. Sådana kunskaper ingår i den konfiguration som definierar normativiteten och lärarens och elevens olika positioner i en undervisningssituation, vilket i sin tur betyder att deras respektive relationer till undervisning och inlärning skiljer sig åt.

Då det gäller undervisning finns olika sätt att resonera. Några forskare anser att det är möjligt att helt förlita sig på pedagogisk och/eller didaktisk teori och helt bortse ifrån inlärningspsykologi som företeelse och teori. Detta synsätt anser jag dock inte är riktigt, eftersom det inte reflekterar vad som sker i en undervisningssituation. Istället är det nödvändigt att betona betydelsen av att utveckla inlärningspsykologiska kunskaper som är av relevans för undervisning och kan utgöra en grund för en didaktisk kunskap.

För att göra detta möjligt är det av betydelse att precisera vissa antaganden som är grundläggande, eftersom dessa bildar utgångspunkterna för en teori och en modell för hur människors inlärning är beskaffad. Dessa beskrivs och diskuteras nedan.

De inlärningspsykologiska utgångspunkterna

Undervisning innebär i realiteten att individnivån måste tas hänsyn till. En klass med 25 elever består av 25 individer och i en undervisningssituation tillkommer en eller flera lärare. Det finns inga andra genvägar till god undervisning annat än att ta hänsyn till individnivån. Exempelvis är varje individ en person med en egen specifik historia och med specifika egenskaper. Detta innebär med nödvändighet att inlärningspsykologi, kognition, personlighetspsykologi, m m kan vara av intresse för att förstå samspelet mellan personerna i en undervisningssituation.

En annan aspekt som man måste ta hänsyn till är förknippad med att all inlärning är individrelaterad. Även i sådana fall då inlärning eller kognition betecknas som kollektiv bygger detta på individuell inlärning och kognition. Men i realiteten är det fråga om individer som lär sig eller tänker. I en undervisningssituation betyder detta att det är specifika individer som skall lära sig genom den undervisning de erhåller. En grupp eller en klass kan inte lära sig någonting utan det är gruppens medlemmar som lär sig eller förstår något.

För att markera den individuella karaktären består den grundläggande delen av teorin av en lärare och en elev och relationen mellan dessa båda individer.

Figur 1. Den grundläggande modellen för undervisning.

Lärare -------------- Elev

Individrelationen betyder vidare att en eller ett flera elever, som i många och väsentliga avseenden är olika, erbjuds samma undervisning och förväntas genom denna lära sig det som är undervisningens mål. Längre fram skall jag mer i detalj diskutera detta problem.

Det finns ett oklart samband mellan inlärning och undervisning, men på empiriska grunder antar vi att undervisning gynnar inlärning. Om man inte kan acceptera detta antagande är det vara svårt att argumentera för undervisning.

Det bör dock påpekas att undervisning inte med nödvändighet är detsamma som klassrumsundervisning med flera elever. På goda grunder vågar jag påstå att denna form av undervisning (d v s klassrumsundervisning med flera elever) inte är särskilt effektiv. Det faktum att utbildningssystemet i mycket hög grad stöder klassrumsundervisning, d v s en lärare som undervisar flera elever, bygger inte på pedagogisk nödvändighet eller är ett uttryck för rön från pedagogisk forskning. Istället är det av ekonomiska skäl som sådan

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undervisning förekommer. Den mest effektiva undervisningen anser jag sker i situationer där det finns en lärare som undervisare en elev. Effektiv och avancerad undervisning är, med det här synsättet, av privat och personlig natur.

Men oavsett form antas undervisning kunna påverka någons inlärning. I en nu pågående studie där elevers sätt att tänka om undervisning studeras framgår med stor skärpa att eleverna i mycket hög grad lägger ansvaret för den egna inlärning på läraren (Wenestam & Sundell, 1996).

I den här studien visar det sig att bland de skriftliga berättelserna om vad 203 elever i åk 7-9 ansåg vara undervisning kunde tre olika sätt att se på undervisning urskiljas. Dessa presenteras kort nedan.

Den första kategorin (A) av svar kännetecknas av ett uttalat "Lärarberoende". Man anser att undervisning är lärarens angelägenhet och det är lärarens skyldighet att se till att elevernas lär sig något. Tillspetsat kan man säga att eleverna deltar i undervisningen i så måtto att de väntar på att inlärning skulle hända dem.

Den andra kategorin (B) av svar beskriver undervisning som en fråga om att läraren skall skapa en god "Inlärningsmiljö". Med detta avses att undervisningssituationen är av störst intresse för de här eleverna. God undervisning innebär med det här synsättet att undervisningssituationen gynnar elevens inlärning och underlättar elevens möjligheter att förstå det som behandlas.

Den tredje kategorin (C) av svar uppmärksammar undervisningens betydelse som ram för elevens egna ansträngningar. Undervisning innebär enligt det här synsättet att eleven arbetar med olika uppgifter och fullgör åligganden som läraren arrangerat. Undervisning innebär för de här eleverna att de deltar aktivt genom att de t ex göra anteckningar eller läsa kurslitteratur. Kategorin kan benämnas "Elevaktivitet".

De här tre grundläggande sätten att resonera om undervisning utgör, så att säga, kategoriperspektivet på elevernas tänkanden om undervisning. Bland de 203 deltagande eleverna kunde ingen ytterligare grunduppfattning om undervisning urskiljas. De här tre beskrivningskategorierna beskriver därmed samtliga olika grunduppfattningar om undervisning som fanns i elevgruppen.

Men bilden kompliceras av att eleverna kan omfatta mer än en uppfattning om undervisning. De tre grundläggande sätten att resonera om undervisning fanns representerade i olika kombinationer bland eleverna, vilket betyder att de fanns i kombinationerna A, B, C, AB, AC, BC, och ABC. Dessa s k sekundärkategorier av elevernas sätt att se på undervisning representerar den individuella beskrivningsnivån. Det intressanta är att den grunduppfattning som karaktäriserades som "Lärarberoende" återfanns i mer än 63% av elevernas beskrivningar av undervisning. Detta betyder att hos en mycket stor andel av elevernas beskrivningar sågs eleverna som passiva mottagare av undervisning och med förväntningar på att läraren skulle se till att de lärde sig vad som förväntades.

Den egna rollen i undervisningssituationen är med det här synsättet mycket passiv och uttrycker en konsumerande förhållning till inlärning. Men elevens förhållningssätt till undervisningen i skolan har även en annan dimension. Enligt denna finns det en intressant relation mellan elevernas inlärning och lärarens undervisning i ett annat avseende, nämligen att undervisningen påverkas av elevens förväntningar. Vi vet att då eleverna har förväntningar på undervisningen eller på läraren uppfattas detta som komplikationer av läraren och innebär att denne tycker att undervisningen blir svårare att genomföra (Larsson, 1983).

Antagande om kunskapens natur eller Hur når vi kunskap?

Avgörande för vår syn på undervisning och inlärning är hur vi tänker oss kunskap och hur kunskap om olika företeelser kan erhållas. Enligt mitt sätt att se på frågan om hur vi når kunskap om något, kan det bara finnas två sätt. De är till viss del beroende av varandra men leder i sina konsekvenser åt olika håll. Kunskapsfilosofiskt har de behandlats av många filosofer och är på så sätt inte okända för oss (Hobbes, Decartes, Locke, Hume, m fl). De båda sätten är:

1. I form av sinnesdata via våra sinnen och

2. via reflektion av tidigare kunskaper.

I båda fallen förutsätter jag att den mänskliga kognitiva förmågan fungerar enligt de teorier och empiriska forskningsresultat som vi känner till från inlärningsspykologi och kognitiv psykologi. Relationen, eller kanske snarare transformationen från elektromagnetisk vågrörelse till att vi förstår det vi läser är i sin helhet inte särskilt känd. Vi vet att informationens natur förändras till sinnesdata och vidare till kognition, från att vara fyskalisk information i form av t ex vågrörelser, strålning, tryck, eller värme, d v s stimuli som upfattats av våra sinnen, till att bli information med innebörd som lagras i vårt långtidsminne och som kan användas för reflektion och generera ny kunskap. En lämplig schematisk beskrivning för att illustrera det här

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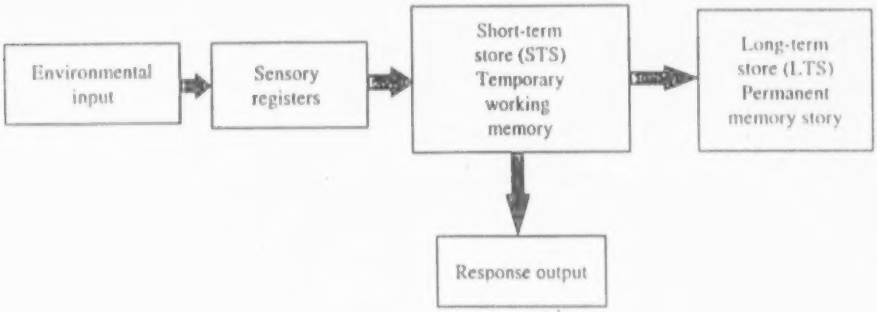
resonemanget kan vara den modell över minnet som ofta förekommer i läroböcker om kognition och inlärning (Baddeley, 1990).

Figur 2. Atkinsons och Shiffrins välkända modell av det mänskliga minnet


Environmental input
Sensory registers
Short-term store (STS) Temporary working memory
Long-term store (LTS) Permanent memory story
Response output

Figuren beskriver ett flöde av "information" i form av fysikaliska stimuli som kommer från en källa utanför individen (Enviromental input). Till följd av sinnenas förmåga att reagera på fyskialiska stimuli och generera elektrokemisk transmission och det kognitiva systemets kapacitet att förvandla elektrokemiska impulser till kognitiv information, kan meningsfull information bli föremål för lagring i långtidsminnet för framtida behov. Av särskild betydelse för undervisning är det kognitiva systemets omvandling av information utan mening till meningsbärande information. I långtidsminnet (LTS) är den grundläggande principen för lagring och återhämtning av information innebörd i olika avseenden. I korttidsminnet (STS) är det framför allt ytlig repetition och uppmärksammande av informationen som gäller för att hålla den kvar. Innebörder beaktas inte där.

Ett av sätten om hur vi kan erhålla kunskap enligt ovan innebär att vi, i betydelsen vårt tänkande, i någon mening har kontakt med världen utanför oss själva (och inom oss själva). Hur denna relation i detalj är till sin natur är svårt att säga med säkerhet. Som jag ser det är det enbart genom sinnesdata som vi kan skaffa oss information om världen utanför oss själva. Med hjälp av våra sinnen erhåller jag information, som inte enbart emmanerar från mig själv. Detta är självfallet en mycket viktig och avgörande punkt för hur synen på undervisning, inlärning och förståelse kan komma att se ut.

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Den störande logiken

Det andra sättet att erhålla kunskap innebär att människor tillämpar den analytiska och/eller logiska förmåga de har. Till skillnad från det sätt som beskrivs i avsnittet ovan, är det inte möjligt att skapa kunskap om omvärlden genom reflektion av i minnet tillgänglig information. För att förtydliga mitt resonemang på den här punkten påstår jag att det inte är möjligt att genom enbart logisk analys, begreppsbestämning, teoretiserande eller tänkande att skaffa fram kunskap om världens beskaffenhet, eftersom all kunskap om omvärlden måste baseras på information, som i någon mening kan antas emmanera från omvärlden i sig. Man kan säga att någonstans i det slutna kognitiva systemet måste det finnas en kanal eller flöde av information, som har sitt ursprung utanför det kognitiva systemet.

Därför är det viktigt att utveckla metoder, som ger oss möjligheter att urskilja, avskilja och synliggöra empirisk omvärldsinformation och att pröva teoretiskt utvecklade problem empiriskt . I vilket avseende sådan information ger en valid och korrekt bild av omvärlden, eller av ett visst fenomen i omvärlden, är som jag nämnde ovan, svårt att uttala sig bestämt om. Det är därför av avgörande betydelse att vi utvecklar lämpliga metoder med vilka vi kan undersöka verkligheten så som den framträder för oss. Vad man med säkerhet kan säga är att all information, eller alla data om omvärlden, samlas in på basen av vissa personliga antaganden om grundläggande ontologiska villkor. Detta betyder att all information är filtrerad genom ett filter av mer eller mindre medvetna och explicitgjorda antaganden. Valida data eller valida utsagor om omvärlden är därför valida enbart i förhållande till de antaganden man har som grund. I den mån sådana antaganden kan bilda ett vetenskapligt paradigm, som kan accepteras av fler personer än den enskilde forskaren, ger detta ökad grad av acceptans och trovärdighet i vetenskapssamfundet för den utförda forskningen. Men som var och en förstår blir ett forskningsresultat varken mer eller mindre sant i förhållande till omvärlden genom ett sådant förfarande.

Jag konstaterade ovan att all kunskap om omvärlden måste bygga på empiriska data. Anledningen till detta är att en människa är ett slutet kognitivt system där kognitiva processer och logisk-analytisk förmåga opererar på information, som är tillgänglig inom systemet. Det här systemet av kognition och logik har i sig inga möjligheter att kunna generera kunskap om omvärlden. Det här systemet kan däremot binda ihop, skapa samband, finna mönster och undersöka logiken i vilka element som helst - även de mest bizzara (Henle, 1962). Vi kan lätt tänka oss att vi försöker utröna riktigheten i syllogismen:

Om alla trebenta stolar är skyskrapor och
alla skyskrapor kan flyga följer att
alla trebenta stolar kan flyga

Vi har inga problem med att söka finna ut riktigheten i den presenterade syllogismen. Men vi inser också att innebörden i syllogismen, och i resonemanget, inte beskriver någon företeelse i vår omvärld. Vad vi har är ett logiskt exempel, inget annat. Detta kan vi pröva med hjälp av de logiska regler som finns och på så sätt slå fast om resonemanget är sant eller falskt i logisk mening. Vår logisk-analytiska kognitiva förmåga kan således operera på information, som inte har någon relation till omvärlden i så måtto att den inte innebär en utsaga om omvärlden. Med dess hjälp kan vi pröva den begreppsliga eller logiska hållbarheten i det vi vill undersöka. Men vi kan inte genom att ställa upp begreppsliga eller logiska satser göra något annat än att uttala oss om just dessa begreppsliga eller logiska satser. Vad vi än gör med sådana satser eller begrepp är det fortfarande omöjligt för oss att säga något om omvärlden. En analys av begrepp och satser är med nödvändighet enbart en lek med ord av den typ som syllogismen ovan är ett exempel på.

För att kunna utsäga något om omvärlden måste vi samla information från omvärlden, analysera den, kognitivt bearbeta den och pröva den empiriskt gentemot omvärlden. Ibland sker en sammanblandning av ett logiskt och ett empiriskt förhållningssätt då vi använder empiriska data i en logisk prövning. Det finns då risk att vi drar slutsatser som inte kan försvaras vare sig logiskt eller empiriskt. Exempelvis kan vi ställa upp en syllogism som opererar på information som är av empirisk karaktär och sedan behandla denna information formallogiskt utan att uppmärksamma att den inte är legitim i det här sammanhanget. Nedanstående syllogism kan få illustrera resonemanget.

Alla människor är dödliga
Jag är en människa
Alltså är jag dödlig

Problemet med en logisk prövning av informationen i syllogismen ovan leder varken till någon hållbar logisk slutsats eller till någon empirisk kunskap. Det logiska dilemmat ligger i att vi inte kan förutsäga vad som kommer att hända med en enskild, nu levande, människa. Det faktum att alla andra tidigare generationer av levande varelser har visat sig vara dödliga betyder inte att jag också kommer att dö. Syllogismen illustrerar problemet med att få helt invändningsfria och sanna förutsättningar. Man kan ifrågasätta riktigheten av det inledande påståendet att alla människor är dödliga. Med vilken rätt påstår vi detta? Ur ett formallogiskt perspektiv begår vi ett logiskt fel, som innebär att vi bryter mot en av de logiska reglerna för slutsatsdraging. I korthet säger denna regel att slutsatser om framtida händelser inte får grunda sig på utsagor om redan inträffade händelser. Utsagan blir då inte längre en fråga om logisk beskrivning utan en utsaga baserad på sannolikhet, där utsagan avser en händelse, som har en mer eller mindre sannolik existens.

Den stora grundläggande skillnaden ligger i att empiriskt erhållen och prövad information kan sägas vara kunskap som har ett sannolikt värde och stabilitet. Liksom alla annan kunskap om omvärlden är emellertid sådan kunskap relaterad till de antaganden forskaren gör. Någon i absolut mening absolut SANN kunskap om omvärlden finns inte. När det gäller logisk kunskap är denna däremot sann i en absolut mening om de förutsättningar som ligger till grund för logiken är sanna. Förutsättningarnas relation till verkligheten har däremot sannolikhetskaraktär.

Men även om vi inte kan erhålla kunskap via logik kan vi använda vår logiska förmåga på den information som vi har tillgänglig och på så sätt pröva den. Den logiska förmågan blir därigenom ett instrument för prövningen av empirisk information.

Vi har därmed identifierat två olika komponenter som är av fundamental betydelse för vårt kunskapssökande. Den ena avser naturen på vår kognitiva förmåga, låt oss kalla det vårt operationella kognitiva system. Den andra är vår förmåga att använda logik. Båda komponenterna innebär begränsningar för vårt tänkande och förståelse. Till exempel kan vi inte uppfatta någonting utanför sinnenas begränsade räckvid och inte heller kan vi logiskt operera med information som överskrider vår logiska förmåga. Sådan information förblir osynlig för oss på samma sätt som Wittgenstein menar då han säger "Wovon mann nicht sprechen kann darüber muss man schweigen" (Wittgenstein, 1922).

Problemet består i att vår logiska förmåga strävar efter att finna t ex logiska mönster, samband och helheter. Den är kopplad till vår grundläggande disposition att tolka och söka innebörd, vår tendens att undersöka och pröva och den är därmed ett instrument för oss då vi vill förstå omvärlden och skaffa oss kunskaper om den. Men resultatet av sådan kognitiv verksamhet inte bara *kan* bli föremål för empirisk prövning utan *måste* bli det, innan vi kan uttala oss om verkligheten.

Men en sådan förmåga innebär ibland problem för oss. En typ av sådana problem har att göra med att vi har behov av att ha ordning (symmetri, polaritet,

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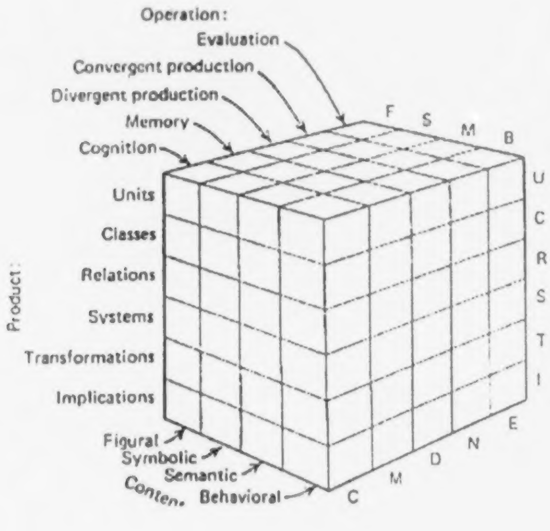
finns det ena så finns det andra, o s v) i de tankeformer vi utvecklar. Ett sådant inbyggt kognitivt beteende som bestämmer mycket av vad vi förstår av omvärlden, är t ex föreställningar om kausalitet, om symmetri, om att det finns en början och ett slut på allt, att det finns motsatspar, finns stor så finns liten. En god beskrivning av den här formen av tänkande presenteras av Platon då han återger Sokrates försvarstal.

Ett mer i tiden nära liggande konkret exempel, som illustrerar den här problematiken, är Guilfords intelligensmodell med tomma boxar. Guilfords modell (Butcher, 1968, 1972) behandlar den mänskliga intelligensen sett ur ett perspektiv där man utgår ifrån olika slag av förmågor (abiliteter). Modellen är tredimensionell och beskriver förmågor som kan variera enligt tre olika dimensioner. För det första kan de variera beroende på de olika slag av grundläggande mentala operationer som finns, t ex kognition, minne, utvärdering, divergent produktion (kreativt tänkande) och konvergent produktion (problemlösning). Vidare kan man ha olika slag av innehåll som kan vara i form av symbolisk information (t ex siffor), semantisk information (verbal), figurativ information och beteendemässig information. Slutligen finns det olika slag av resultat/utfall som innehållet kan anta då det processas, d v s innehållet kan vara i form av element, klasser, system, relationer eller transformationer och implikationer.

Figur 3. Guilfords intelligensmodell i tre dimensioner


Operation:
Evaluation
Convergent production
Divergent production
Memory
Cognition
F
S
M
B
Units
Classes
Relations
Systems
Transformations
Implications
U
C
R
S
T
I
Product:
Figural
Symbolic
Semantic
Conten.
Behavioral
C
M
D
N
E

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Den här modellen genererar en tredimensionell kub med totalt 120 celler, som var och en antas representera en särskild abilitet. Modellen har kritiserats hårt för att de ingående variablerna inte representerar oberoende abiliteter. En annan form av kritik ansluter till vårt resonemang. Det logiska dilemma modellen illustrerar har att göra med dess relation till empirin. Exempelvis kan man fråga sig varför den är tredimensionell och inte tvådimensionell. Vidare kan man ifrågasätta antalet komponenter. Varför inte fler eller färre. Men det stora problemet är att alla modellens celler inte har någon relation till någon empirisk verklighet. De borde i logisk mening ha kunnat relateras till empiriskt belagda förmågor men alla abiliteter som kan härledas ur den tredimensionella modellen finns inte i verkligheten. I verkligheten antas antalet förmågor vara betydligt färre än vad Guilford förutsätter i sin modell (Eysenck, 1994).

Den mänskliga logiska förmåga människor har är ett kraftfullt instrument då det gäller att upptäcka och intellektuellt pröva mönster, helheter och innebörder. På så sätt är den logiska förmågan det instrument med vars hjälp vi skapar innebörder av högre ordning av information än vad som gäller då vi först möter information. I varje ögonblick möts en människa via sinnena av ett informationsflöde av orelaterade fysikaliska stimuli (se Atkinsons & Shiffrins modell ovan). Tack vare förmågan till logisk förmåga skapar vi innebörder. Jag kommer i nästa avsnitt att behandla detta mer utförligt.

"Effort after meaning"

Två krav måste ställas på den speciella pedagogiska kognitiva psykologi, som diskuteras här, om den skall kunna vara till nytta för undervisningssektorn.

För det första kan man kräva att den måste kunna bilda en enhet med undervisning och för det andra kan man kräva att den måste kunna förklara kvalitativ variation då det gäller människors sätt att tänka om omvärlden. Nedan presenterar jag en sådan enhet av pedagogisk psykologi och undervisning. Denna sätter samtidigt in den kvalitativa variationen av uppfattningar av omvärlden i ett teoretiskt sammanhang, som gör det möjligt för oss att förstå och förklara dem.

En av de centrala frågorna i det här sammanhanget gäller kunskapssynen och hur vi kan nå kunskap om något? Hur vi väljer att betrakta grunderna för vårt kunskapstillägnande avgör hur vi kan förhålla oss till inlärning och undervisning.

En annan central fråga är sambandet mellan undervisning och inlärning. För att denna relation skall bli möjlig att studera måste två villkor uppfyllas. Det ena är att vi måste kunna utnyttja såväl ett pedagogiskt som ett kognitivt

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perspektiv vid studiet av undervisning och inlärning. Det andra är att inlärning måste beskrivas i termer av sitt innehåll, vilket innebär att det en elev har lärt sig eller förstått skall beskrivas i termer av undervisningsinnehållet.

De här synpunkterna på sambandet mellan undervisning och inlärningpsykologi kan beskrivas i tre punkter, vilka diskuteras nedan.

Den första gäller kunskapssynen och människan som kunskapstillägnande varelse. Vi vet att människan lever i en värld skapad av människor för människor. Denna värld är i allt väsentlig en värld byggd på innebörder. Vårt mentala förmåga är konstruerad för att hantera innebörder och om sådana inte finns söka efter möjliga sätt att förstå den information vi möter. Dreyfus (1972) påpekar att det finns en inbyggd disposition hos människan som innebär att vi föds med en disposition att alltid försöka förstå den information vi möter. Detta må gälla spädbarnets cirkulära reaktioner (Piaget) eller den vuxna människans tolkning av ny information i okända miljöer.

Vår intellektuella kapacitet, inklusive vår logiska förmåga, gör, vilket nämndes ovan, det möjligt att söka finna mönster, innebörder, relationer, med vars hjälp vi kan avgränsa information och göra den tillgänglig för vidare kognitiv analys. Detta senare kan illustreras genom ett stort antal exempel. Då det gäller den störande logiken kan den ses som ett konkret exempel på människans disposition att söka finna stabila mönster som ger en plattform för den tolkning av informationen som behövs för att tolkningsresultatet skall uppfattas som begripligt.

Människor som skall lära sig något de inte förstår gör stora ansträngningar att ge innebörd åt inlärningsstoffet. Ett välkänt exempel är Tulvings (1962) studie av minnet. I denna studie lät han deltagarna läsa listor med ord som inte i något avseende var relaterade till varandra. Tidigare forskning hade visat (Miller, 1956) att människor försöker reducera och få ordning och reda i ett material som man inte förstår. Tulving fann att hans försökspersoner skapade vad han kallade *subjective units* (S-units). Detta betydde att deltagarna gjorde stora ansträngningar att organisera de presenterade orden i grupper efter vissa identifierbara principer. Undersökningsdeltagarna försökte alltså finna begripliga indelningsgrunder hos det obegripliga materialet i avsikt att bättre kunna överblicka det, lära sig det och komma ihåg det. Man försökte alltså genom att organisera materialet på ett subjektivt sätt reducera komplexiteten utan att samtidigt förlora information.

Ett annat sådant exempel kan vara det resonemang en liten gosse förde i en intervju om hur han tänkte sig döden. Gossen var mycket tydlig och berättade utförligt om hur han föreställde sig hur människor som avlidit blev änglar och kom till himmelen.

Gossens huvudtanke var att människorna kom till himlen när de dog. Men först begravdes de i en kista nere i jorden. Detta gav upphov till ett logiskt problem. Bevisligen befanns sig de döda människorna på jorden. Hur kom människorna till himlen? Jo, sa gossen det skedde bara när det regnar. Då flög de döda som änglar till himlen. Argumentet var, att då det regnar höll sig de levande människorna inomhus. Därför hade ingen sett denna händelse.

Ett annat illustrativt exempel som också illustrerar vår förmåga att skapa meningsfulla helheter kan hämtas från Bartlett (1932).

> Some years ago the Paramount Chief of the Swazi people, accompanied by several of his leading men, visited England for the purpose of attempting to obtain a final settlement of a long-standing land dispute. When the party returned, there was naturally some curiosity among the British settlers in Swaziland concerning what were the main points of recall by the native group of their visit to England. The one thing that remained most firmly and vividly fixed in the recollection of the Swazi chiefs was their picture of the English policeman, regulating the road traffic with uplifted hand.
>
> Why should this simple action have made so profound an impression? Certainly not merely because it was taken as a symbol of power. Many other illustrations of power, far more striking to the European mind, had been seen and, for all practical purposes, forgotten. The Swazi greets his fellow, or his visitor, with uplifted hand. Here was familiar gesture, warm with friendliness in a foreign country, and at the same time arresting in its consquences. It was one of the few things they saw that fitted immediately into their own well-established social framework, and so it produced a quick impression and a lasting effect (Bartlett 1932).

I det förra exemplet ligger betoningen på den lille gossens sätt att resonera sig fram till en rimlig förklaring till ett faktum som han inte betvivlade. Hans problem var att finna en väg ut ur ett intellektuellt problem. I det andra exemplet fokuseras det mänskliga minnets natur. Frågan gällde "Vad kommer man ihåg efter en tid?" Det är ett välkänt faktum, vilket bl a Bartlett (1932) har visat, att minnet (långtidsminnet) är innebördsberoende och uppvisar konstruktiva drag. Att kunna urskilja innebörder, eller om inte detta är möjligt, att kunna konstruera innebörder på basen av tillgänglig information är därmed av central betydelse för all minnesbehållning. Men båda exemplen ovan beskriver människans sätt att skapa rimliga förutsättningar och sammanhang för att göra den upplevda informationen begriplig.

Vårt förhållningssätt till omvärlden är således, allsedan vår första tid ett ständigt sökande efter innebörder. Vi har en tydlig och mycket stark drift att vilja förstå. Bartlett (op.cit) kallar f ö detta för "effort after meaning", eftersom vi genom detta får underlag för vårt tänkande, för vår förståelse och för vidare bearbetning och agerande. I de fall då vi inte omedelbart kan förstå informationen gör vi vårt bästa i att skapa innebörd. Vi använder oss då av all information vi har tillgänglig i ögonblicket och gör bästa möjliga tolkning av informationen. Principen för denna innebördskonstruktion är att den gäller ända tills den motsägs av annan information. Om en sådan kognitiv konflikt inträffar tvingar den oss till omstruktureringar och förändringar av vår förståelse och vårt vetande. I Piagets terminologi motsvaras detta av frånvaron av ekvilibrium och eventuellt med att en stadieförändring inträffar. Inom fenomenografisk forskning är sådana förändringar tecken på en kvalitativ förändring och representerar uppkomsten av nya tankeformer.

En sådan förändring kan upplevas som både euforisk eller plågsam men betyder då det inträffar *de facto* att vi har förändrat vår kunskap om omvärlden. I en intervjustudie, där kärnkraftens produktion av elektricitet var i fokus, framträder mycket tydligt de intervjuades ansträngningar att konstruera helheter, som kunde förstås och där den information man hade tillgång till ingick på ett acceptabelt sätt.

Det pedagogiska och kognitiva perspektivet

Den andra punkten innebär att vi med nödvändighet måste utnyttja både ett pedagogiskt och ett kognitivt perspektiv, då vi vill diskutera inlärningspsykologi som en del av undervisning. I själva verket är det till stor del medvetenhet och lyhördhet från lärarens sida som det är fråga om. Kanske skulle man kunna sätta etiketten inlärningspedagogik på en sådan inlärningspsykologi.

Ovan beskrev jag den grundläggande skillnaden mellan ett pedagogiskt och ett kognitivt perspektiv på inlärning. Om man väljer att se inlärning ur ett pedagogiskt perspektiv medför detta att inlärning relateras till undervisningen på ett sådant sätt att undervisningens syfte blir av intresse då inlärningen studeras. Konkret betyder detta att det undervisningsinnehåll eleverna skall ha lära sig kommer att relateras till de intentioner läraren har haft med undervisningen. För enkelhetens skull kan vi tänka oss att eleverna undervisats om eller läst ett avsnitt ur en historiebok som behandlar "Orsakerna till Första Världskriget". Om vi med detta som utgångspunkt studerar elevernas inlärning av detta specifika innehåll, måste vi utgå från vad som var lärarens intention med undervisningen och fråga oss i vilken utsträckning elevernas inlärning motsvarar/är relaterad till denna. Vi får således en situation, där vi kan uttala oss om ifall eleven har uppfattat lärarens undervisning så som den skall uppfattas, eller om de har missförstått texten. Vi kan därmed göra normativt grundade utsagor om enskilda elevers kunskaper om "Orsakerna till Första Världskriget" och vi kan ge dem vitsord för deras prestationer. När vi studerar inlärning ur ett pedagogiskt perspektiv finns således alltid en normativ dimension närvarande, som avgör om en studieprestation är högt eller lågt värderad relativt ett redan bestämt kriterium.

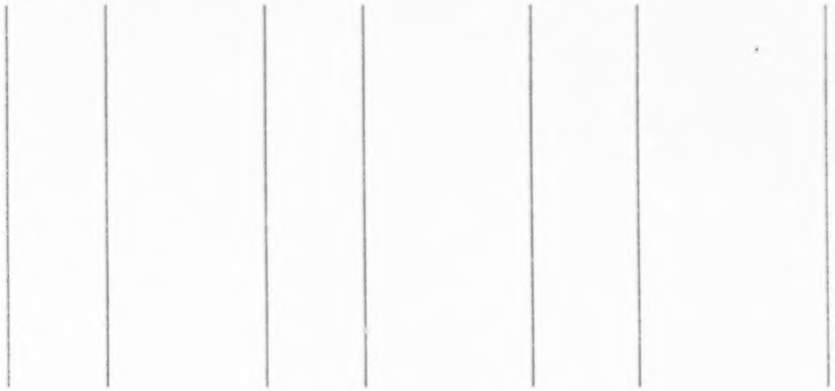
Men för att kunna urskilja grunden för vår undervisning måste vi samtidigt kunna byta till ett kognitivt perspektiv, frigöra oss från den normativa relationen till undervisningsuppgiften och istället studera de studerande. Konkret innebär detta att en lärare måste försöka finna sätten på vilka de studerande resonerar, hur de strävar efter att finna mönster, helheter och innebörder i det som behandlas under lektionerna.

Det här synsättet har sin grund i Gestaltpsykologisk teori. Med utgångspunkt i ett kvalitativt förhållningssätt till inlärning och kognition kunde Gestaltpsykologisk forskning (Katona, 1940; Koffka, 1963; Köhler, 1947; Wertheimer, 1968) visa att människors inlärning och kognition i hög grad är beroende av vår förmåga att bilda meningsfulla helheter (Gestalten). Man kan säga att vi har en förmåga att lyfta fram viktig information och placera den i förgrunden och låta mindre viktig information bilda en bakgrund. Resonemanget ansluter väl till Bartlett's (se tidigare) beskrivning av vår strävan efter meningsfullhet. Ofta använde gestaltpsykologerna perceptuella figurer för att illusterar innebörden i de perceptuella lagar man formulerade. Betrakta figuren nedan.

Vi kan se att figuren visar ett antal lodräta streck men dessa kan även med lätthet ses som "stolpar" eller "pelare", som framträder mot en bakgrund. Dessa tre stolpar är, på sätt och vis, något vi har läst ut av streckfiguren. Vi har med en sådan "lösning" bildat en figur som innehåller mer information än vad som gäller för strecken enbart. Figuren är mer meningsfull än tidigare.

Katz (1947) använder figurer av det här slaget för att illustrera de "gestaltpsykologiska lagarna". Den lag figuren ovan illustrerar är "Likhetslagen", som anger hur vår varseblivning tenderar att söka öka meningsfullheten i det vi ser genom att foga samman information som objektivt sett inte har något samband. Vad som finns i figuren ovan är ett antal vertikala streck. Vi tenderar emellertid att se "stolpar", "pelare" eller "band". Likhetslagen säger: "Om flera olika element äro verksamma i retningsfältet, finns det en tendens att, ceteris paribus, sammanfatta element, som likna varandra, till en grupp" (op. cit. s 46).

Figur 4. En figur med "stolpar" framträder mot en bakgrund.



En annan "lag" säger att "...Linjer, som innesluta en yta och sålunda bilda en sluten figur, uppfattas lättare som en enhet under i övrigt lika betingelser, än sådanan linjer som inte bilda en yta" (op. cit. s 47).

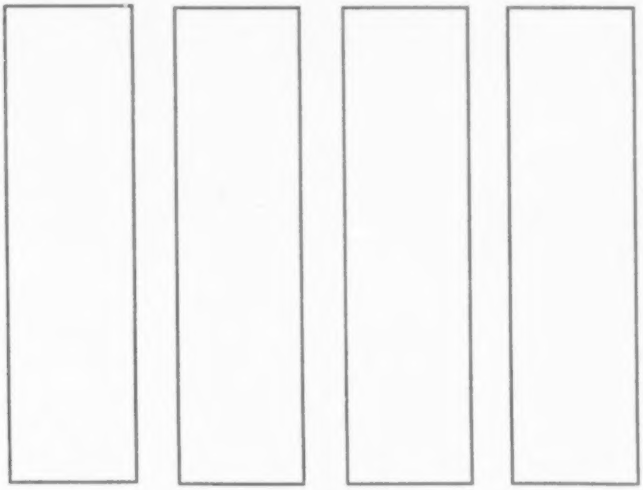
Det framgår tydligt att "innebörden" av figuren ovan förändras, den blir meningsfull men på ett annat sätt, om vi förändrar figuren något (Figur 5 nedan) genom att lägga till streck i båda ändarna av några av strecken i den förra figuren. Med ett annan terminologi kan vi säga att vi lägger till mer information, vilket leder till att figurens innebörd förändras och vi kan "läsa ut" något annat än vad vi kunde göra ur den tidigare figuren.

Vår varseblivning är således i hög grad inriktad mot att söka finna meningsfullhet och bilda mönster och foga samman information i mer informationsrika sammansättningar. Sådan mer meningsfull information bildar en förgrund, medan icke-meningsfull information bildar bakgrund.

Exakt samma typ av resonemang kan vi använda då det gäller verbal information. Vi har samma förmåga att lyfta fram verbal information och innebörder så att denna bildar en "bättre figur" och låta annan information bilda bakgrund. Exempelvis vid minnesbehållning (se tex Gomulicki 1956) är det den "viktigaste delen" av det inlärda som behålls, medan "mindre viktig" information tappas bort. Gomulicki menar att en sådan reducering av informationen är selektiv och uttryck för en abtraktionsprocess. Han säger att

> "... a close correspondence between an element's contribution to the total meaning of a passage and the frequency with which it is represented in reproductions shows clearly that the omissions are not fortuitous but reflect an active process. The selection and organization of stimulus material by this process is essentially abstractive in effect (op. cit. s 89).

Figur 5. Slutna figurer bildar förgrund mot bakgrunden.



I bakgrunden till Gomulickis resonemang finns Bartletts (Bartlett 1932) studier av minnet insatt i ett socialpsykologiskt sammanhang. Bartlett försöker ge en förklaring till varför det mänskliga minnet fungerar på det sättet det gör. I flera experiment visade han att människans kognitiva system och där närmast minnet a) inte registrerar all information som presenteras, b) inte behåller information på slumpmässig basis utan på basen av vissa funktionella principer och c) är relaterat till kognitiva strukturer av tidigare erfarenheter och kunskaper -scheman. Dessa ligger till grund för vad som man kommer ihåg. Han säger att minnet består inte av väckandet av en samling livlösa spår (lifeless and fragmentary traces, p.213) utan är

> … an imaginative reconstruction, or construction, built out of the relation of our attitude towards a whole active mass of organised past reactions or experience, and to a little outstanding detail which commonly appears in image or language form. It is thus hardly ever really exact, even in the most rudimentary cases of rote recapitulation, and it is not at all important that it should be so. The attitude is literally an effect of the organism's capacity to turn round upon its own 'schemata', and is directly a function of consciousness (op. cit. s. 213).

Men liksom då det gäller vår perceptuella varseblivning och Gomulickis beskrivning av vad vi kommer ihåg, är det i grunden en fråga om att att kunna urskilja en figur av viktig information mot en bakgrund av mer obetydlig information.

Den typ av organiserad kunskap som Bartlett kallar 'schemata' ger oss vägledning och hjälper oss att förstå omvärlden och den information vi möter. Ett välkänt, ofta använt exempel på vad som avses med schema är hur våra kunskaper om hur det är att äta middag på en restaurang hjälper oss, eftersom det efter ett sådant restaurangbesök finns information i minnet i form av ett 'restauranschema'(Anderson, Spiro & Anderson, 1978).

Figur-grund och kognitivt schema fenomenen, blir tydliga på ett annat sätt om vi begrundar följande verbala illustration.

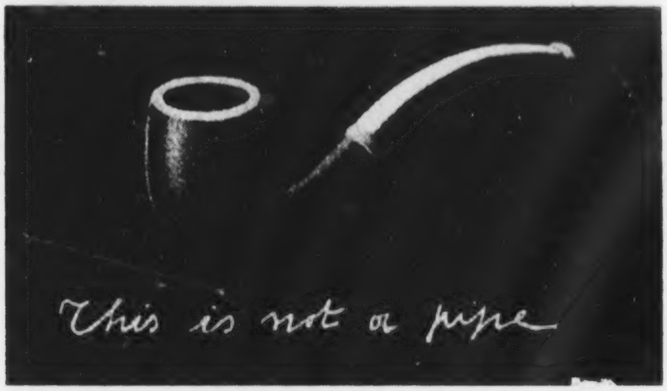
> Vid ett fängelse i U S A var det dags att avrätta en dödsdömd fånge. Situationen var mycket prekär. Det var fråga om minuter innan domen skulle gå i verkställighet och den dömde avrättas. En begäran om nåd hade inlämnats till guvenören och man väntade på svaret. I sista minuten kom fängelsets telegrafist springande med ett inkommet telegram från guvenören. Det löd:
>
> Avrätta ej benådad.

En läsare av detta meddelande kan inte utan vidare avgöra vilken tolkning som är den rätta. Läsarens problem ligger inte i att texten är svår att förstå utan ligger i att den ger möjlighet till mer än en tolkning. Vilken av de båda möjliga tolkningarna som är korrekt är omöjligt att avgöra på basen av den information texten ger. Inte heller finns det någon annan information, som kan användas för att öka eller minska sannolikheten för riktigheten i den ena eller andra tolkningen man kan göra. Vi har således inget kognitivt schema, som tillhandahåller lämplig information.

Texten illustrerar en verbal variant av figurens relation till bakgrunden. Läsarens dilemma består i att det inte går att avgöra vilken figur som är den riktiga, eftersom det går att urskilja två lika sannolika figurer som står i motsatsförhållande till varandra då det gäller de innebörder de representerar. I egenskap av läsare av "Avrätta ej benådad" befinner vi oss i samma situation som den som betraktar en av av de figurer är berömda för att de kan uppfattas på två olika sätt t ex Rubins (1915, i Bernstein, Roy, Srull & Wickens, 1991, s 184) berömda vita vas mot en svart bakgrund, som också kan ses som två ansikten som betraktar varandra. Figuren som framträder i den bilden är mycket tydlig. Det finns sålunda ingen intellektuell svårighet förknippad med att urskilja den framträdande figuren mot bakgrunden. Läsarens, i textexemplet, och observatörens, då det gäller bilderna, tveksamhet består främst i att avgöra vilken av de båda urskiljbara gestalterna som är figur och vilken som är bakgrund.

Men tolkningssvårigheten kan även gälla bestämningen av vad som är figuren och inte dess tydlighet eller urskiljbarhet. Ett exempel på detta är är Magrittes målning av en pipa. På målningen står skrivet "This is not a pipe". Vad avses? Uppmärksamhetens riktning är det första som måste bestämmas av en observatör innan det är möjligt att bestämma sig för vad som avbildas. Men på vad skall uppmärksamheten fokuseras? Om det inte är möjligt att avgöra fokus för uppmärksamheten uppträder ett stadium av "oscillerande" uppmärksamhet som behöver annan typ av kognitiv insats för att kunna avslutas.

Figur 6. Magrittes målning som ett exempel på problematisk innebördsfokusering


This is not a pipe

Det jag har försökt illustrera ovan är en teoretisk grund för hur människan som lärande, varseblivande och aktiv varelse fungerar i ett dynamiskt sammanhang, som är i ständig förändring - människans normala livsmiljö.

Varje person skapar sin egen förståelse av omvärlden och agerar i enlighet med denna. Människan måste därför ses som en ständigt tolkande, adapterande varelse med en stark drift att förstå världen och att kunna kontrollera och styra skeendet. I grunden kan detta ses som ett intresse som är relaterat till en ökning av människans överlevnadsmöjligheter. En god tolkning av en företeelse eller en situation kan öka sannolikheten för överlevnad både bildlikt och bokstavligt, genom att personen vinner fördelar i något avseende.

DEN PSYKOLOGISKA GRUNDEN

Låt mig få presentera en teori om undervisning som grundar sig på pedagogisk psykologisk teori. Denna teori ger grunden för didaktisk teori, eftersom den på ett mycket konkret sätt har betydelse för hur man undervisar. Den presenterade teorin bör kunna leda till ökad grad av förståelse och sensitivitet hos läraren då det gäller elevernas tänkande. Den insikten eller kunskapen kan sedan lätt omvandlas och användas i undervisningen för att medvetandegöra eleverna och därigenom gynna deras inlärning.

Mot den bakgrund som skisserats ovan, när det gäller mänsklig inlärning och kognition, är det tydligt att vi måste förutsätta att i åtminstone ett viktigt avseende är det ingen skillnad mellan läraren och eleven. Jag avser då det faktum att både läraren och eleven förstår omvärlden på ett personligt och privat sätt och är aktivt engagerade i att skapa innebörder för att förstå det som sker i den situation de befinner sig och där de möts. Läraren och eleven liksom alla andra människor skapar sin förståelse, vilket innebär att den kan variera innebördsmässigt (kvalitativt) mellan olika personer och även inom varje person om vi utsträcker tiden. (Wenestam, 1980).

I den enklaste formen har vi alltså en lärare och en elev, som båda skapar innebörd och förståelse av den information, som är tillgänglig. De skiljer sig sannolikt åt i kvalitativt avseende i sin respektive förståelse av omvärlden, t ex beträffande sättet att förstå ett bestämt undervisningsinnehåll.

I en normal undervisningssituation är både läraren och eleven medvetna om att de deltar i undervisning. Både läraren och eleven har intentioner, som å ena sidan är anpassade till situationen och å den andra också gör att situationen kan definieras som en undervisningssituation. Intentionerna gäller således både förväntningarna på vad situationen innebär och hur man förhåller sig till den.

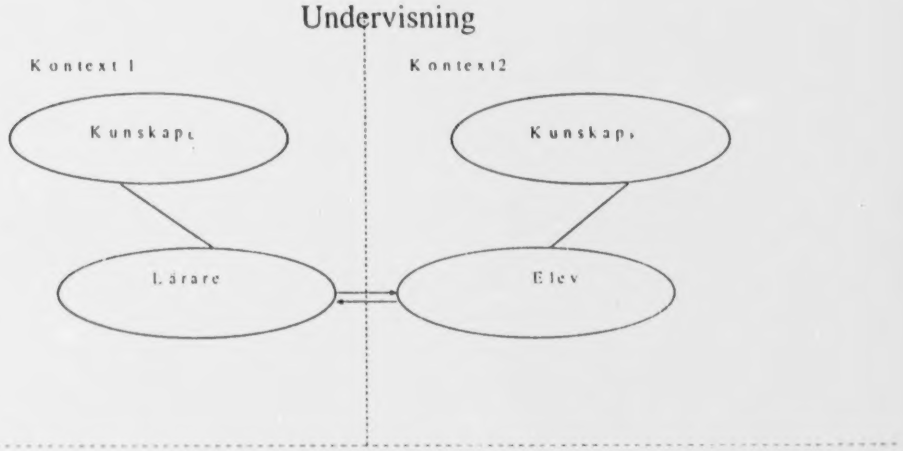
Förhållandet mellan läraren och eleven både bestäms av och bestämmer formen och innehållet i situationen. Ytterst handlar den pedagogiska verksamheten om att eleven skall förändra sitt sätt att tänka i riktning mot det som skolan och läraren kan acceptera som riktigt och acceptabelt.

Kanske kan man uttrycka förhållandet mellan läraren och eleven som att i undervisningssituationen möts, i fysisk bemärkelse, två kognitiva system som vardera har kvalitativa relationer till situationen och till omvärlden. Detta innebär att båda systemen aktivt försöker skapa innebörd av den information som finns tillgänglig i situationen.

Men två, i hög grad dynamiska kognitiva system, som båda är aktivt engagerade i att skapa meningsfullhet och helhet av den information som är tillgänglig, ingår i ett överordnat mycket komplext system med interagerande delar, som benämns undervisning och utbildning. Komplexiteten blir uppenbar då man betänker att det ena kognitiva systemet - läraren- har intentionen att förändra det andra systemet - elevens tänkande - i något planerat avseende.

Nedan presenteras i Figur 7 den teoretiska modell som resonemanget ovan grundar sig på. Figuren utgår ifrån en situation där en lärare och en elev interagerar. Båda personerna bär med sig in situationen sin personliga historia, personliga kunskaper och personliga förutsättningar och intentioner. Figuren är avsedd att avbilda en generell undervisningssituation.

Figur 7. Grunden för undervisning består av en lärare och en elev som interagerar.



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Figuren ovan visar således en situation där en lärare undervisar en elev. Bägge personerna ingår i ett undervisningskontext, som de också genom sin närvaro och verksamhet definierar. Men de är också enskilda personer med olika bakgrunder, roller, positioner m m (Biddle & Thomas, 1966) som gör att vi med visshet kan säga att de bär med sig olika kontext (Kontext 1 och Kontext 2) in i undervisningssituationen.

Men det mest centrala är det faktum att de är olika personer, med skilda kunskaper och kognitiva erfarenheter och historier. Detta visas i figuren genom att det till både läraren och eleven finns personligt relaterad "Kunskap". Vad beträffar läraren inkluderas dennes utbildningskunskaper, ämneskunskaper, samhällskunskaper, personliga kunskaper, m m i denna "Kunskap". Detta innebär att en person som är utbildad lärare *per definition* har kännedom om läroplanen, stoffet, lagar och förordningar, eleven och annan information som är av intresse för en lärare att veta. Det går därför inte att separera läraren, läroplanen och stoffet från varandra på ett meningsfullt sätt. En lärare måste betraktas som en helhet där personen och personens kunskaper och erfarenheter inte kan avgränsas från varandra. Det t. ex. förväntas av en lärare att denne har kännedom om det undervisningsinnehåll som skall behandlas. Vidare förväntas att denne har allmän kunskap om hur man undervisar och vilka formella och informella regler som är av betydelse för undervisning. Allt som definierar en lärare och den uppsättning egenskaper som är nödvändiga ingår i den begreppsliga konfigurationen "lärare".

Konsten att undervisa innebär i det här sammanhanget lärarens kompetens med avseende på om denne är tillräckligt känslig/lyhörd för att uppmärksamma och förstår att ta tillvara elevens sätt att tänka om det undervisningens behandlar. För att i nästa moment utnyttja den informationen för att öka elevens medvetenhet i något, för undervisningssituationen relevant, avseende. Därigenom ökas precisionen i undervisningen så att elevens inlärning med högre sannolikhet sker i önskad riktning.

Genomförande av undervisning -en treststegsmodell

Människan som tänkande och lärande varelse kännetecknas framför allt av en framträdande egenskap, nämligen en tydlig vilja att skapa innebörd av information. Detta är empiriskt välbelagt och jag har ovan beskrivit en teoretisk grund för detta.

Undervisning måste utgå ifrån människans natur. Detta innebär att undervisning, för att vara funktionell, måste vara relaterad till människans tendens att aktivt skapa innebörder och understödja människans förhållningssätt till information, så att meningsskapandet optimeras.

För att optimera denna tendens har människan ett mycket dynamiskt förhållningssätt gentemot omvärlden, vilket bl a har beskrivits av Piaget. Detta är empiriskt väl understött.

I grunden handlar således god undervisning om att understödja elevens naturliga tendens att försöka skapa mening och innebörd av den information som strömmar emot honom/henne. Detta betyder *i realiteten* att eleven försöker skapa mer meningsfullhet utav tillgänglig information, än vad som är givet. Vidare måste god undervisning utveckla denna elevens förmåga att skapa mening och högre grader av meningsfullhet.

Jag föreslår att undervisning skall ses som en aktivitet som innehåller tre moment eller steg. Nedan ger jag en beskrivning av detta och formulerar därmed en trestegsmodell som grund för undervisning. Den uppmärksammar primärt läraren och dennes verksamhet. Modellen är den innehållsliga delen av den strukturella grundmodell som presenteras i Figur 1 (ovan), där lärare-elev förhållandet betonas.

Det första steget innebär att läraren medvetet riktar uppmärksamheten mot elevens sätt att förstå undervisningsinnehållet, d v s det som behandlas under lektionerna. Det andra steget innebär en systematiserad analys av elevens sätt att tänka, genom att kvalitativa aspekter av elevens förståelse och sätt att resonera granskas och beskrivs. Dessa båda moment innebär att ett kognitivt perspektiv (Wenestam 1993) på elevens sätt att tänka appliceras. Genom en sådan kvalitativ analys får läraren kunskap om hur varje elev bygger upp sin kunskap, vad man stödjer sig på, vad man tar för givet, vilka utgångspunktr man har. Vidare framträder, i en sådan analys, vad eleven väljer att fästa uppmärksamhet på och hur och varifrån eleven har valt sina argument. Det tredje steget innebär att läraren medvetet transformerar den information, som erhållits, genom steg ett och två, till undervisningsinnehåll. Detta betyder att läraren måste byta förhållningssätt, från ett kognitivt perspektiv till ett pedagogiskt. Kunskap om varje elevs sätt att resonera och tänka om ett givet undervisningsinnehåll skall således omvandlas till pedagogisk handling, genom att läraren omvandlar sin kunskap om den kvalitativa variationen som kännetecknar elevernas sätt att resonera till meningsfulla helheter, som kan behandlas under lektionerna och då gynna den enskilde elevens inlärning.

Nedan lämnar jag en mer detaljerad beskrivning av de tre momenten i modellen.

Moment 1.
Undervisning är en intentionell handling där läraren har det ledande ansvaret och därmed även ansvaret för utfallet - elevernas inlärning. Men enligt den inlärningspsykologiska bakgrund, som ovan presenterats, antas varje elev och varje lärare sträva efter att skapa innebörder och meningsfullhet av den information som finns tillgänglig i varje situation. Detta leder till att man bland en grupp studerande kan förvänta sig att det förekommer olika sätt att resonera och att uppfatta den information som föreligger, t ex i form av olika sätt att förstå ett visst undervisningsinnehåll.

Det är nödvändigt för läraren att kunna fånga upp den kvalitativa variationen som förekommer bland eleverna. Sådan kvalitativ variation kan gälla en enskild elev som "oscillerar" mellan olika sätt att förstå vad läraren har sagt under en lektion eller vad som presenterats i en lärobok. Men kvalitativ variation gäller också skillnader mellan flera olika elevers sätt att tänka och förstå något. En fokusering på elevernas kvalitativt olika sätt att förstå något innebär en förändring av lärarens perspektiv, från undervisningen till elevernas tänkande om det undervisningen behandlar. Till saken hör också att denna förändring innebär en skiftning från ett *normativt perspektiv* till ett *relativt perspektiv*, genom att läraren lämnar ett pedagogiskt perspektiv. I detta perspektiv, som är ett normativt perspektiv, kan elevernas prestationer och tänkande kan värderas och tilldelas vitsord men då läraren måste byta till ett kognitivt perspektiv är detta inte längre meningsfullt. Där är huvudintresset att förstå elevernas tänakinde, vilket betyder att syftet är att samla så mycket information som möjligt om elevernas sätt att resonera om undervisningsinnehållet utan tanke på normativitet eller värdering av denna information.

Moment 1 i den presenterade trestegsmodellen handlar om att öka lärarens medvetenhet och lyhördhet för elevernas olika sätt att förstå läraren, läromedlen och undervisningen. Momentet innebär att läraren samlar information om elevernas sätt att resonera och tänka och lär sig hur de förstår det som behandlas i undervisningen. Detta kan innebära att läraren måste organisera undervisningen på ett sådant sätt att elevernas sätt att resonera framträder. Det kan vidare handla om att uppmuntra och träna elever i att formulera sina tankar och uttrycka dem och att lära dem arbeta med den egna förståelsen. I hög grad är det för läraren en fråga om ett metaperspektiv på förståelsen det handlar om, genom att eleverna skall reflektera över den egna förståelsen. Men framför allt är det fråga om att läraren, såsom ansvarig för den undervisning eleven får, skall öka sin medvetenhet och kunskap om elevernas sätt att resonera. Detta kan endast ske genom att läraren etablerar ett förhållningssätt till eleverna och till undervisning, som ger karaktäriseras av lyhördhet för elevernas resonemang om undervisningens innehåll eller vad som i övrigt är i fokus för undervisningen.

Exempelvis kan det i nybörjarundervisningen i en lågstadieklass gälla läsinlärningen. En medveten och tränad lärare kanske upptäcker att det bland de unga eleverna finns olika sätt att se på (Heilä-Ylikallio & Wenestam, 1993). Kanske är det så att en del elever tänker sig läsandet som en förmåga att utläsa meningen ur text medan en annan grupp elever är inriktade mot svårigheterna att begripa sig på bokstäver och text och att läsning för dessa senare framför allt innebär ett tekniskt problem. En tredje grupp elever framstår för läraren inriktade mot en social-emotionell komponent som läsning innebär i deras erfarenhetsvärld, nämligen att någon läser något spännande och att läsningen är förknippad med trevnad och trygghet.

Ett annat exempel kan gälla läsförståelsen av texter (Wenestam 1978) där läraren upptäcker när eleverna får till uppgift att återberätta vad texten handlar om, att en del av dem förstår textens innehåll som en serie av episoder. En återberättelse kan med en sådan förståelse få följande allmänna form: "Först beskrev man X, sedan kom en bit om Y, efter det kom Z och så slutade texten med Q". Andra elever väljer däremot att organisera textens innehåll hierarkiskt, vilket kanske betyder att de strukturerar textens innehåll efter innehållets betydelse för helheten. De skiljer således mellan överordnad och underordnad information och en återgivning kan lyda: "Textens viktigaste budskap var att X. Detta exemplifierades med Y. För att få ytterligare information jämfördes sedan X med Y och …"

Ett ytterligare illustration på kvalitativ variation kan hämtas från hur vuxna personer förstår kärnkraft och hur det är möjligt att producera elektricitet genom kärnkraft (Wenestam, 1987). Det valda exemplet appellerar kanske inte direkt till den som är inriktad mot grundskolans undervisning men har intresse om man betänker människors sätt att fungera vid inlärning och förståelse. Nedanstående intervjusvar illustrerar två olika sätt att tänka om hur man får elektricitet från kärnkraft.

> Ja, ska .. ta det i stora drag så är det ju liksom att det, man då för ... - en reaktion liksom och hur man ska då förklara reaktorn det är att om man kör ner uranstavar, som det heter och, så att det liksom, man för ner dom och får igång en kemisk reakation, en reaktion mellan dom här stavarna då och vätskan.
>
> [Man kör ner dom? Var kör man ner dom?]

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Jaa. I vatten i en bassäng, i vatten i en reaktor alltså, det är ju en innesluten kapsel liksom med vatten då, och tillsammans med då styrstavar som man då styr den här eldhärden, som den kallas för.
[Hum, hum.]
Eller uranhärden, jag vet inte, men HÄRD kallas den för, men i alla fall så när man kört igång den här så börjar det på och blir ånga då sen, förångas det här vattnet.
[Vilket blir ånga?]
Vattnet som det värms upp ifrån härden alltså...
[Hur kan det värmas upp då?]
Ja, det blir ju ganska varm när man sätter igång den här uranklyvningen ... Det är det som bildar värmen och när vattnet blir varmt så kokar det till slut och när det kokar så bildas det ju ånga och den ångan den leds ju ut då till turbiner om det är - det finns olika slags verk nu, dom man har i Sverige är man ju, dom leds då ut direkt till en turbin .... den ångan då, den driver då turbinen som driver en generator då.

Ett annat sätt att resonera framträder i nedanstående intervjuutdrag.

... det är en liten explosion, om man säger så, va ... en liten, liten, miniatyrexplosion som genererar alltså energi ... Och detta tar man då tillvara i, i en reaktor....
[Tar tillvara på det, sa du?]
Ja, man tar tillvara till en ... ehhh. Ja, du vet det blir ju avfall, va. det är bränsle, det blir avfall, det blir en hel del energi. man tar tillvara energin ...
[På vad sätt då?]
Ja, det är värmeenergi, skulle jag kunna tänka mig. Och det värms väl upp,..
...
... jag vet bara att det är farligt. Ja, det är uran naturligtvis du använder. Bränslet är uran. Uranbränsle, ja. Som är tungt, det kommer jag ihåg, där är många atomer, ja.
...
... uran, eftersom det är ett bränsle så måste det sättas igång, va ... Så det blir vätgas och någonting annat ... tror jag. ... Och då utvecklas en enorm värme....
...
[...vad är det som händer då?]

> Ja, det är klart att en del väte, det är en gas, va ... det förflyktigas ju. Sedan måste du använda tungt vatten, det kommer man ihåg från de där krigsfilmerna, att det skall vara tungt vatten.

De valda exemplen är avsedda att illusterar den principiella utgångspunkt jag ovan har försökt beskriva utifrån ett pedagogisk-psykologiskt teoretiskt resonemang. Grundtanken är att undervisning av elever inte kan betraktas som en aktivitet riktat mot en kollektiv enhet som en klass eller grupp utan att viktig information går förlorad. Sådan information kännetecknas av att den kan variera mellan och inom individer på ett kvalitativt sätt, på så sätt att deras sätt att uppfatta en lektion eller en text kan skilja sig åt med avseende på innebörd och mening. Den första nivån eller momentet i modellen handlar om att bli varse denna kvalitativa variation.

I det följande momentet, Moment 2, riktas uppmärksamheten mot tolkningen av den uppfattade kvalitativa variationen, som beskrivits i Moment 1.

Moment 2

När läraren har uppmärksammat den kvalitativa variation, som kan förekomma hos en elevgrupp, då det gäller undervisningsinnehåll eller läsförståelse eller något annat som berör undervisningen, måste han/hon systematisera och organisera informationen. Detta är nödvändigt eftersom informationsmängden annars kanske inte kan utnyttjas fullt ut av läraren, då den riskerar att inte bli överblickbar i full utsträckning. En antal elevers utsagor om ett visst undervisningsinnehåll kan naturligtvis betraktas som individuella reaktioner och funderingar, som inte har med varandra att göra. De kan snabbt öka i antal, omfattning och komplexitet och det kan därför vara svårt för läraren att förstå vad enskilda elever menar. Men om det då är möjligt att finna gemensamma kvalitativa likheter och skillnader i de studerandes sätt att resonera leder detta till att informationsmängden kan reduceras och grupperas enligt någon innehållslig kvalitet. Även i det här momentet måste läraren ha ett kognitivt perspektiv som utgångspunkt. Det viktiga är således inte en fråga om rätt eller fel eller bra eller dåligt, utan gäller istället uppmärksammandet av elevernas sätt att tänka och resonera.

I nybörjarnas sätt att resonera om läsning ovan, kan hela mängden olika elevsvar reduceras till beskrivningar av tre överordnade förhållningssätt till läsning. En del barn menade att läsning handlade om att kunna förstå en text, andra barn menade att läsningen gällde problemet med bokstäverna och en tredje grupp såg läsning som en socio-emotionellt behaglig aktivitet. En lärare som har intentionen att lära de här barnen läsa har med stor sannolikhet mycket att vinna på att ta tillvara elevernas sätt att resonera om läsning, för att på så sätt anpassa undervisningsinsatsen till de enskilda barnen.

På ett liknande sätt kan man se att det hos en grupp elever finns olika sätt att förhålla sig till texter vid läsning. Somliga elever radar upp informationen som en serie händelser, allteftersom de omnämns i texten, medan andra försöker finna ut författarens intentioner och vad som är viktigast i texten. Kunskap om sådana olika sätt att läsa i en elevgrupp ökar lärarens möjlighet till pedagogiska insatser och gynnar elevernas möjligheter som lärande personer. Sådan kunskap bör kunna leda till att läraren inser att elever med olika sätt att läsa texter måste medvetande göras om detta och behandlas på olika sätt i undervisningssituationen. Kunskaper om elevernas sätt att läsa och förhålla sig till texter ger också en möjlighet för läraren till ökad förståelse av elevernas sätt att förstå det som behandlas i de texter som används i undervisningen. På så sätt kan läraren agera individspecifikt i större utsträckning än vad som är möjligt utan denna elevspecifika kunskap.

I det tredje valda exemplet framträder, i de två presenterade citaten, olika sätt att resonera om hur elektricitet framställs genom kärnkraft. Det centrala i de båda intervjuutdragen är att de presenterar, den tidigare nämnda, djupt förankrade tendensen att konstruera eller skapa meningsfulla helheter av den information, som finns tillgänglig. Vi ser hur personerna strävar efter att bygga upp ett logiskt resonemang, där den information de presenterar bildar en meningsfull helhet, som kan vara möjlig att förstå. I det första citatet handlar det om att värma vatten med kärnkraft i avsikt att bilda ånga, som sedan kan driva en turbin, som i sin tur driver en generator, som producerar elektricitet. Det förda resonemanget utnyttjar informationen så att den bildar en begriplig meningshelhet. Läsaren kan förstå hur kärnkraft producerar elektricitet.

I det andra citatet finner vi motsvarande strävan att bilda en meningsfull helhet. På ett ännu tydligare sätt försöker personen bygga en helhet av information som introduceras. I citatet talas bl a om "liten explosion", "avfall", "värmeenergi", "bränsle", "uran", "atomer", "väte" och "tungt vatten", som de flesta människor förknippar med kärnkraft. Men den här personen kan inte konstruera någon meningsfull helhet som inkluderar den information som introducerats. Istället lämnas läsaren i ett tillstånd av upplyst förvirring. Man har fått en mängd information given men ingen sammanhängande meningsbärande figur har framträtt.

Det tredje momentet i den föreslagna modellen innebär att läraren transformerar sina kunskaper om eleverna tillbaka till ett pedagogiskt perspektiv. Huvudtanken är att omsätta kunskaperna om elevernas sätt att tänka i konkret undervisning.

Moment 3
Genom att uppmärksamma elever som individer, som är i färd med att aktivt förstå sin omvärld, t ex vad läraren säger eller vad som presenteras i en lärobok, får läraren information om hur de resonerar, tänker, förhåller sig och agerar i förhållande till det som behandlas i undervisningen. Det är viktigt, vilket nämndes ovan, att inte blanda samman individnivån med en nivå där man intresserar sig för kollektivet. Problemet, som uppstår med en sådan sammanblandning, blir tydligt i samma ögonblick man måste förklara hur ett kollektiv lär sig, kommer ihåg eller minns något. Det är självklart, och ett obestridigt faktum, att endast enskilda individer kan uppvisa kognitiv förmåga. Det är därför viktigt att vara lyhörd för enskilda elevers sätt att resonera och inte se en klass eller en grupp elever som en undervisningsenhet i annan bemärkelse än som administrativ enhet.

Den kvalitativa information som uppmärksammats i det första steget i modellen och som analyserats och tolkats i det andra skall i det tredje steget - Moment 3 - av läraren utnyttjas och omvandlas till undervisningsinnehåll. Avsikten är därigenom att låta eleverna ta del av varandras sätt att resonera om en given företeelse och därigenom bli medvetna om alternativa sätt att tänka. I det första exemplet ovan kan det vara av betydelse att diskutera läsande och läsning med nybörjarna, för att peka ut läsinlärningens intentioner. I det andra exemplet kan det innebära ett kunskapstillskott för eleverna att känna till hur andra elever läser texter. Detta kan komma att påverka horinsontalläsande läsare till att anlägga ett hierarkiskt läsbeteende och kanske öka förståelsen bland eleverna för hur olika sätt att förstå en text uppkommer.

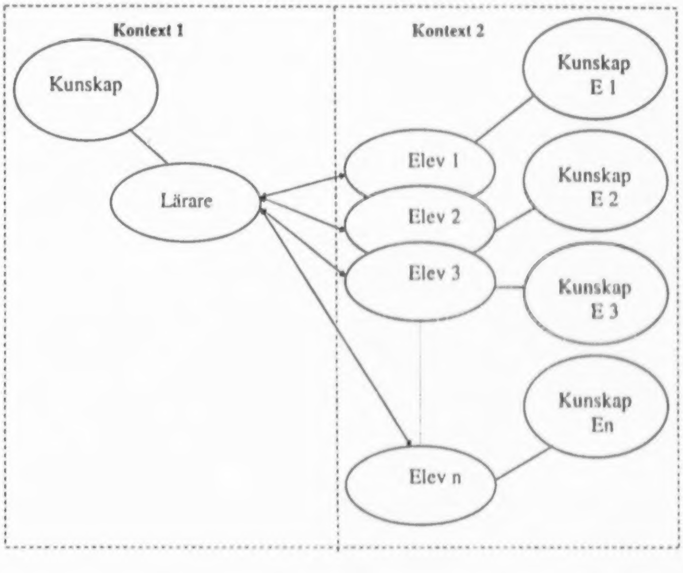
I det tredje exemplet ovan kan man lära sig att förstå mekanismerna som ligger bakom byggandet av kunskap men också visa på hur olika man kan tänka sig produktionen av elektrictet från kärnkraft. Det första exemplet är en bra grund att stå på om man vill skapa en tydlig figur, som förklarar framställningsprocessen. Kanske kan man formulera den så enkelt som att det handlar om att koka vatten till ånga som driver en turbin och en generator som ger elektriciet. Figuren är tydlig och klar till sin karaktär och ger den grundläggande förståelsen för hur elektricitet framställs av kärnkraft. Om det är möjligt att, på basen av elevernas olika sätt att resonera, kunna formulera en tydlig gestalt eller figur av det här slaget kan denna resultera i Aha-upplevelser, som gör att fler elever förstår vad saken gäller.

I Moment 3 är det således lärarens uppgift att omformulera sin kunskaper om elevernas sätt att tänka till användbar pedagogisk kunskap. Detta innebär att läraren måste röra sig från en situation, där allt är accepterat och av lika värde (Momenten 1 och 2), till en situation som kännetecknas av intentionalitet och normativitet (Moment 3). Det kognitiva perspektivet måste överges till förmån för det pedagogiska.

Implikationer för undervisning

En implikation av den föreslagna modellen är problemet som uppstår då antalet elever ökar i klassen. Redan några få elever innebär att den kommunikativa interaktionen ökar i undervisningsituationen och blir mycket komplex. Det kognitiva perspektivet på undervisningens och elevernas sätt att resonera som är nödvändigt under momenten ett och två i den föreslagna modellen ställer stora krav på lärarens förmåga att urskilja elevernas resonemang. I Figur 8 nedan visas interaktionen med läraren från ett obestämt antal elever.

Figur 8. Fler elever ökar komplexiteten i undervisningsituationen



Figuren visar dock inte den interaktion som man kan förutsätta sker mellan eleverna. Om vi antar att även mellan-elev interaktionen är av betydelse för lärarens möjligheter att förstå eleverna, inser man att det inte är lämpligt att låta elevantalet öka alltför mycket i klasserna. Det är inte möjligt att i förväg bestämma vad som är ett lämpligt elevantal i en klass, eftersom detta är beroende av alltför många tillfälliga parametrar. Man kan dock anse säkert att ett elevantal på 30 elever eller mer i en klass inte är försvarbart.

En vanlig modell för didaktiskt tänkande och undervisning är den s k didaktiska triangeln. Triangeln utgår ifrån tanken att Läraren, Eleven och Undervisningsinnehållet bildar en trehörning (se Gundem, 1991, 1996).

Den didaktiska triangeln är dock i huvudsak ett instrument för analys och granskning av undervisning. I triangeln kan man, om man väljer att fokusera uppmärksamheten på elevnoden, lyfta fram problemet med alltför många elever i klassen eller i vilken grad det är fråga om motiverade elever eller inte eller om de kommer från studiemotiverande miljöer, etc.

Då det gäller stoffet, d v s undervisningsinnehållet, kan det anta olika former, t ex det kan vara lätt att förstå eller vara komplicerat, det kan vara på svenska eller på engelska, det kan vara fråga om lättläst text eller en svår problemlösningsuppgift.

Slutligen läraren kan var motiverad eller inte, medveten eller inte, empatisk eller inte, lyhörd eller inte, bra undervisare eller inte, etc.

Men det stora problemet med den didaktiska triangeln är att den inte tillför eller genererar ny kunskap om hur undervisning bör bedrivas. Den didaktiska triangeln opererar enbart med vad som är givet som förutsättning och innebär i realiteten att forskaren får ett instrument med vars hjälp det är möjligt att organisera och systematisera information om de ingående komponenterna. Den är således ett hjälpmedel vid analys av information då den anger en dimension för analysen medan de båda övriga dimensionerna i modellen kontrolleras. Men de intressanta dimensionerna söks inte efter i datamängden utan är givna i förväg.

Det stora problemet med modellen är emellertid att den opererar med tre komponenter som om de vore jämbördiga och oberoende av varandra. I min ovan beskrivna modell förutsätts att läraren och eleverna har kunskaper som är viktiga för skolarbetet och undervisningen. För lärarens del förutsätts således att denne har bakgrundskunskaper i form av t ex ämneskunskaper, pedagogiska kunskaper, och psykologiska kunskaper och annat som utgör lärarens personliga och professionella kompetens. Dessa kunskaper utgör naturligtvis endast en bråkdel av vad en vuxen person utbildad till lärare är bärare av. Av avgörande betydelse är dock att dessa kunskaper är en del av den personliga kompetensen. På motsvarande sätt förutsätter min modell att eleven har kunskaper om skolan, undervisning, ämnet m m. Elevens kunskap, om än annorlunda än vad som gäller för läraren, är personlig och ingår i personkonfigurationen och bidrar till helheten på samma sätt som gäller för läraren. Detta synsätt innebär att det inte är meningsfullt att bryta ut undervisningsinnehållet som en särskild komponent, som kan ställas mot de båda andra komponenterna eleven och läraren på samma betydelsenivå som de.

Samma sak kan uttryckas på annat sätt. Modellen jag föreslår bygger på en teoretisk konstruktion baserad på pedagogisk psykologi, som fokuserar på meningsfullhet, innebörder och kvalitativa skillnader då det gäller människors sätt att tänka, förstå och komma ihåg information. Vad elever och lärare tänker om något utgör, i den här modellen, den grundläggande informationen. Den undervisning en lärare bedriver är med det här synsättet en direkt tillämpning av vad denne kan utläsa av elevernas sätt att tänka om stoffet. Elevens tänkande om stoffet blir därmed den naturliga avgränsningen för lärarens genomförande av undervisning. Stoffet har därmed ingen annan existens än som tänkande hos eleven och hos läraren. För både eleven och läraren finns dessutom uppfattningar om hur den andre parten tänker om stoffet. Stoffet, undervisningsinnehållet, kan i den här modellen varken lyftas ut från lärarens kunskaper eller från elevernas kunskaper på ett meningsfullt sätt.

Det här resonemanget leder till slutsatsen att området ämnesdidaktik inte har någon egentlig innebörd. Eftersom det i modellen argumenteras för att det är elevens tänkande om ämnet som är den väsentliga komponenten, bör undervisning vara relaterad till detta. Enligt ämnesdidaktiskt argumentation är det emellertid ämnets specfika karaktär som är det väsentliga och med avgörande betydelse för hur undervisning skall bedrivas. Men om man kan acceptera elevens tänkande som utgångspunkt för hur undervisning skall bedrivas, bör detta leda till insikten att det är av mindre betydelse vilket ämne undervisningen gäller. Därmed är det svårt att förstå betydelsen av en ämnesdidaktik, där man utgår ifrån ämnets specifika egenskaper och utifrån detta försöker utveckla undervisning, som gynnar elevernas inlärning av ämnet.

I strukturella grundmodellen (se Figur 1) ingår endast två huvudkomponenter - läraren och eleven - relaterade till varandra genom en intentionell interaktiv relation. Utan lärare och elev kan inte undervisning tänkas. Läraren och eleven måste därmed betraktas vara primära komponenter i all didaktik. Däremot finns inte stoffet i samma bemärkelse som läraren och eleven. Undervisningsinnehållet - stoffet- finns inte på annat sätt än som av läraren och eleven uppfattat stoff. Detta innebär att undervisningsinnehåll inte kan tilldelas samma status som läraren och eleven i undervisningssituationen.

Undervisningsinnehållet blir därför sekundärt i förhållande till undervisningsituationen.

När det gäller undervisningsinnehållet - stoffet, kan det därför inte lyftas ut från läraren och eleven och göras till likvärdig enhet med läraren och eleven, eftersom detta måste ses som en del av personkonfigurationerna, vilket har nämnts ovan. Detta blir tydligt om man väljer att se på undervisningsinnehållet - stoffet och skolans läroplan som något som inte har någon existens annat än i människors tänkande. Läroplanen och stoffet finns bara som uppfattningar av något. De har således ingen oberoende existens gentemot de andra komponenterna i modellen och kan därför inte ligga på samma nivå i modellen och har därför inte samma betydelse för undervisningens bedrivande. Både undervisningsinnehåll och läroplan finns inom personerna och kan därför inte lyftas fram och ställas mot dessa i en didaktisk triangel.

Resonemanget kan sammanfattas som att undervisningsinnehållet, stoffet:

1. Är underförstått att ingå som en nödvändig komponent i lärarkompetensen. Man kan därför ej *per definition* vara lärare utan att vara innehavare av undervisningsinnehåll.
2. Kan ej separeras från individens (lärarens och elevens) förståelse av detta.

Detta innebär att ett undervisningsinnehåll finns bara som någons tänkande och kan därför inte jämställas med den som tänker. Ett undervisningsinnehåll finns därmed endast som uppfattningar hos människors och kännetecknas av kvalitativ variation på samma sätt som all annan information som människor möter. D v s det finns inget undervisningsinnehåll i objektiv mening, som kan fungera som utgångspunkt för didaktik.

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